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In This Issue

Application of vacuum in wells producing casinghead gas. Some interesting sidelights for gasoline plant men on conditions resulting from this practice by Harry Pennington.

Recent improvements in the manufacture of lubricating oil as developed on the West Coast. A complete description of methods devised for handling California oil by Carl J. Von Bibra.

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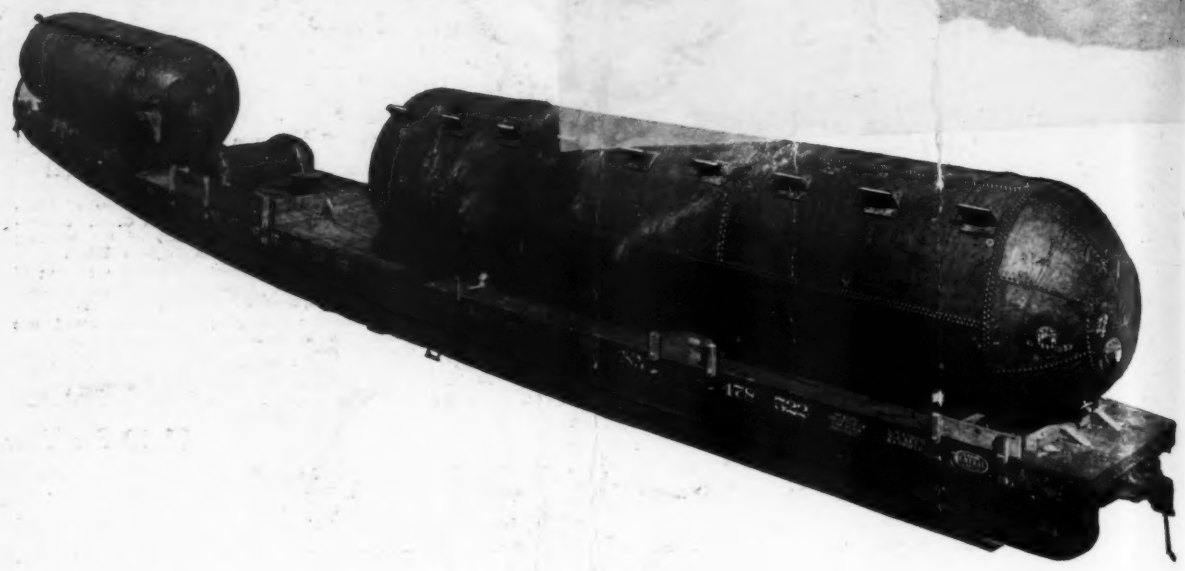

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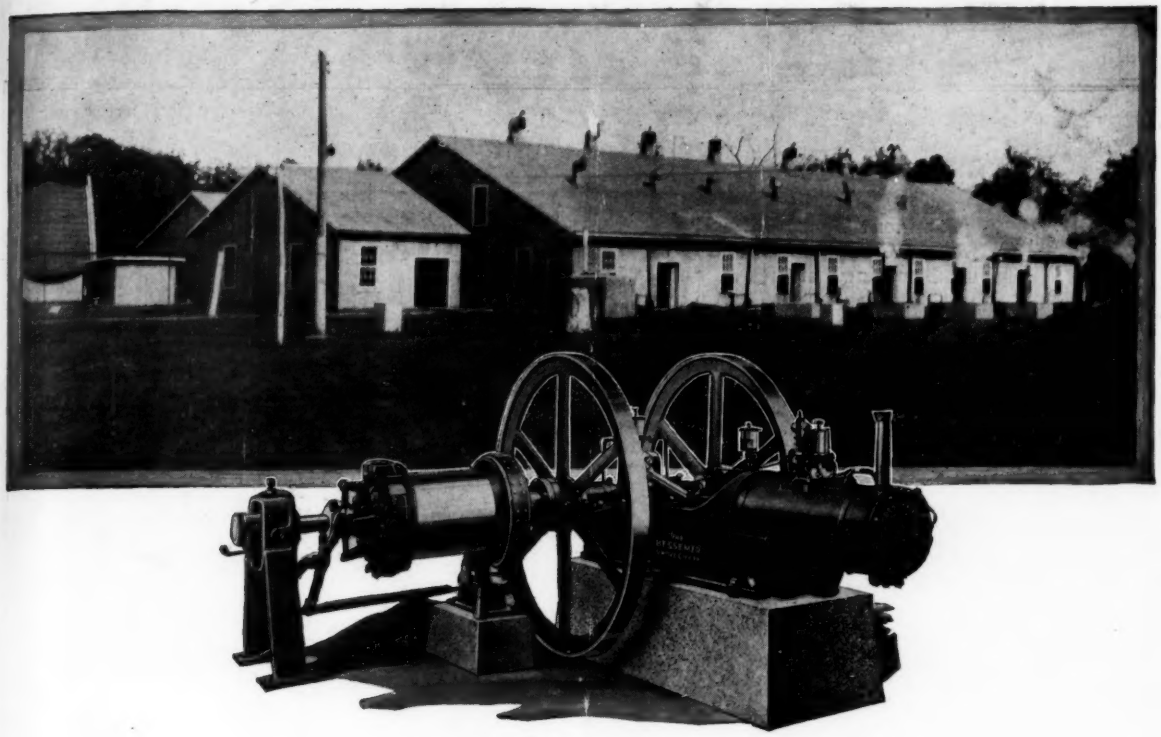

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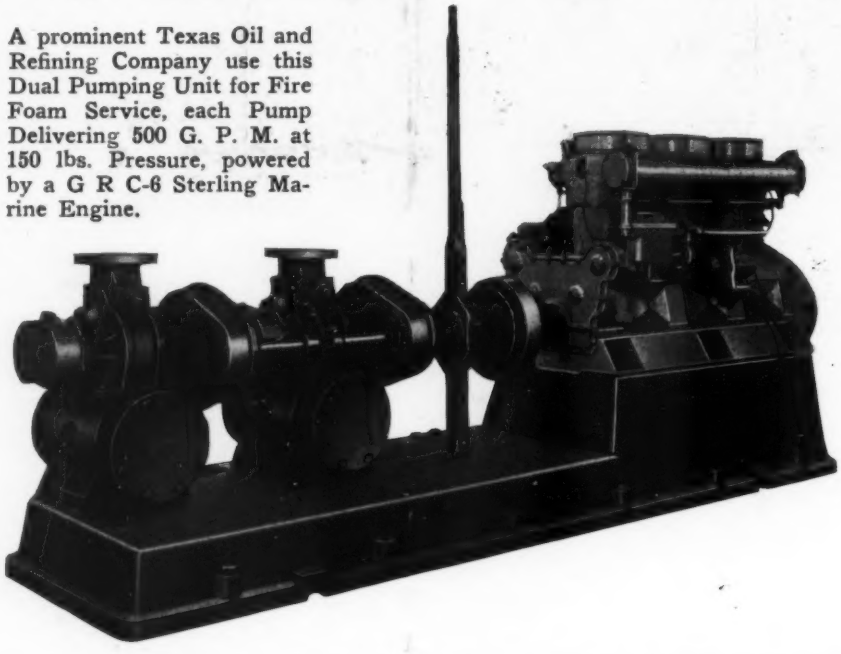

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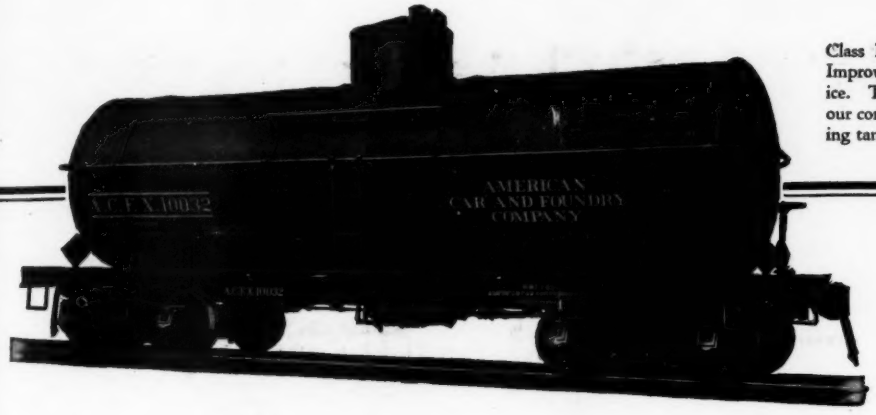

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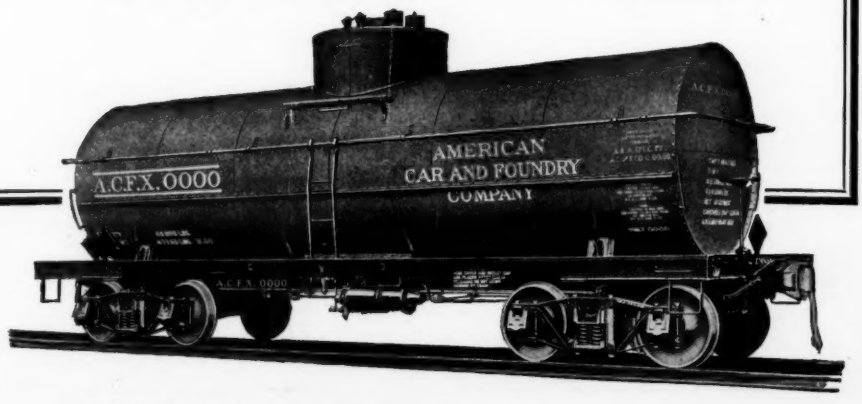

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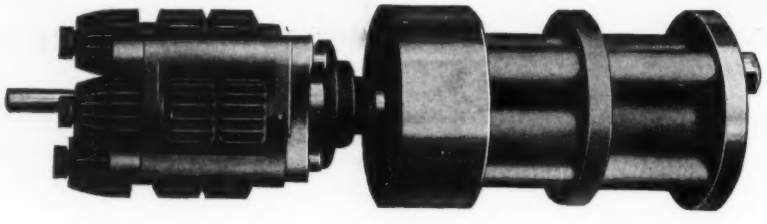

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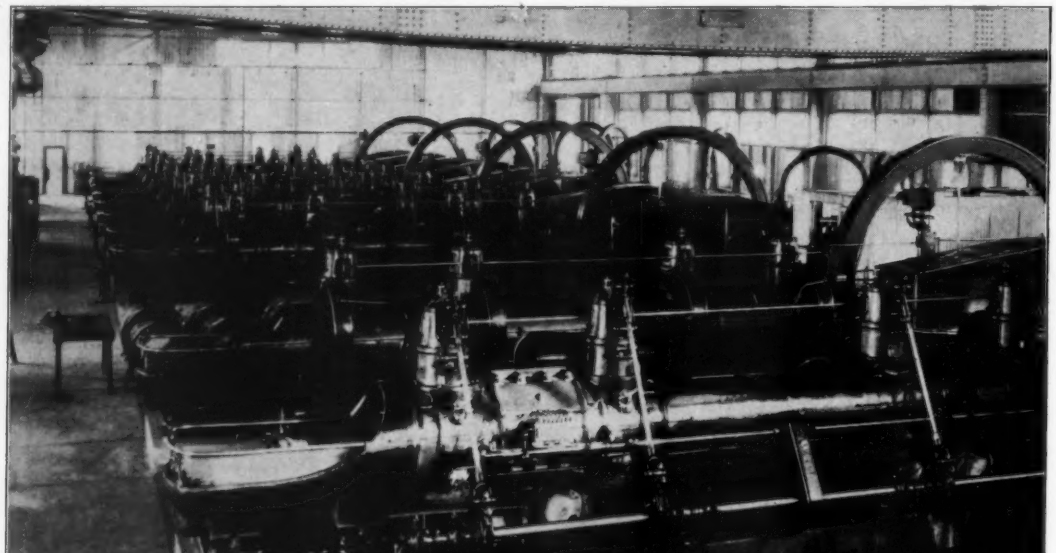

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Methods of Treating Lubricating Oils

In handling California crudes refiners have had to design systems to meet needs

By Carl J. von Bibra,
Chemical Engineer

THE manufacture of lubricating oils is a relatively new development on the Pacific Coast. It is only about fifteen years since considerable commercial quantities of lubricating oils have been manufactured in California. In that period one after another of the large refining organizations have developed into this branch of the business until at the present time about 230,000 barrels per month of California lubricants are manufactured. This total includes a large variety of oils, the bulk of it consisting of neutrals varying in viscosity from 100" to 700" Saybolt at 100° F. A limited quantity of heavier stocks is also manufactured, but these are used exclusively for blending purposes in the refineries manufacturing them. Many attempts have been made to manufacture Bright Stocks from California crude. Two of the largest lubricating plants are now, and have been for some time, manufacturing California Bright Stocks more or less equivalent to Mid-Continent products in flash, fire and viscosity at 210 degrees F. There are good indications that the manufacture of such heavier stocks will soon be general, due to radical changes in treating and filtering methods now being introduced.

Methods Developed to Fit Needs

The lubricating oil refining processes first used on the Pacific Coast were modeled closely on those in use east of the Rocky Mountains. From here a gradual development has taken place, the result of which has been the development of a refining technic particularly suited to the crudes available. This development has been more or less parallel to a similar one along the Gulf Coast, there being a remarkable similarity in the lubricating crudes of the two sections.

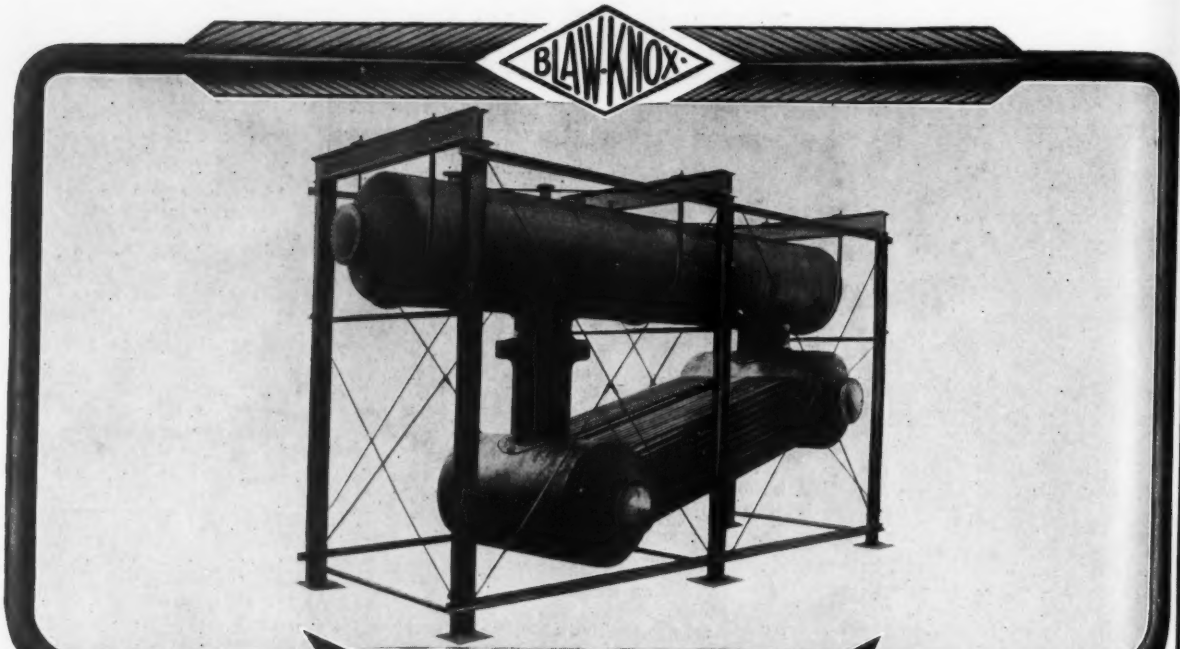
California crudes vary in composition from pure asphalt base to practically paraffine base. For statistical purposes the crude production of the State is divided in two on a gravity basis. The point of division is 20 degrees Be. Roughly speaking, 110,000 barrels per day of oil of less than 20 degrees Be. gravity is being produced at the present time. This is largely settled production. The oil contains very little if any gasoline and consequenly is generally classified as fuel crude and is so segregated by the pipe line companies. The production of oil of higher than 20 degrees gravity is at present in excess of 500,000 barrels per day and represents the gasoline-containing crude which is put through the California refineries. After the gasoline, kerosene stock and a limited quantity of fuel distillates is topped from this crude, the residuum is also marketed as fuel. In attempting to obtain a birds-eye view of the possibilities of lubricating oil manufacture in California one would naturally assume that the residuum from this light refinable crude would also be available as a source for lubricating distillate. This, however, is not the case under present economic conditions. The reason for this is that the lighter crudes of California are almost without exception waxy. There is not sufficient wax to make its extraction commercially feasible even in conjunction with lubricating oil manufacture, but there is just enough to be a nuisance. To remove it would run up the cost of lubricating oil inordinately and yet the yield of wax would not be sufficient to help pay for the operation.

Much Mixed Stock Could be Reclaimed

This same question of wax is also met with in the crude heavier than 20 degrees Be. Of the 110,000 barrels of this oil produced daily, probably not over 75,000 barrels a day is sufficiently free from wax to yield cold-test oils. Calculating from the quantity of lubricating oil at present being manufactured in California, one comes to the conclusion that less than half of this 75,000 barrels per day of available lubricating crude is at present being utilized for lubricating oil manufacturing purposes. A considerable proportion of this unused oil is of course mixed in the field with waxy crudes and consequently becomes unavailable as soon as it enters the pipe line system. Nevertheless, it could be made available by a re-segregation of crude in the field. The ultimate conclusion is, therefore, that there is plenty of wax-free oil available in California for lubricating oil manufacture for a long time to come. Assuming that the amount of heavy oil that will be produced in the future in California will not be greatly increased over the present production, it will, nevertheless, be several decades before it will be necessary to depart from the exclusive use of wax-free oils and embark upon the use of wax removing processes on any considerable scale in the California lubricating oil refining industry.

Processes in Use

The first few companies who started to make California lubricants in a sense may be said to have learned from one another through the inevitable transfer of personnel. The natural result of this parallel development was that the lubricating oil refining methods in general use showed great similarity. With the exception of one isolated successful case of combined vacuum and steam distillation, the California companies are making their lubricating distillates by continuous distillation in stills heated by furnaces and provided with both open and closed steam coils. The distillates thus obtained are either reduced with steam by re-running or else are segregated into sufficiently close cuts by efficient dephlegmation. The proper reduction of these distillates is extremely important because of the more or less volatile unstable compounds which are produced during distillation irrespective of the amount of steam used or vacuum applied. Of course the greater the proportion of steam or the higher the vacuum, the smaller would be the proportion of unstable compounds produced. These unstable constituents of California lubricating distillates have been one of the chief sources of trouble, since they, more than any other one factor, are respons-



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ible for color instability in the finished oils.

Until very recently it has been general practice to take the reduced lubricating distillate and treat it with several doses of sulphuric acid. Sixty-six degree Be. acid has been the most generally used, though 98 per cent acid has many advantages and is now used by several refiners. After the acid treatment and a water knock-down, the oils have been neutralized with dilute caustic soda solution and washed with hot water in the usual manner.

Some Recent Variations

The expression "have been" is used advisedly, since the last two years have seen radical changes in the established California lubricating oil refining technic. In two cases high speed centrifuges have been installed for the purpose of cutting down the time element in settling out the soap water from washed oils. The reduction of this time factor has been important because of the back-up in color during the washing process. Centrifuges have also been adopted for the soda-treating of lubricating distillate before the acid treatment.

While the use of centrifuges is a distinct modification of well known methods, the use of highly absorptive clays and earths constitutes a radical departure into an entirely new field. The filtering of lubricating oils has never been popular in California. In this case the term "filtering" is used to describe the percolation of oil through a bed of granular filtering material. Three or four companies have used the percolating filtration process in California for some years. All admit its great expense. Wherever possible oils are treated to color with acid and the filtration is eliminated.

New Filtering Processes

A number of patents have recently been granted to several California refining companies for filtering processes in which the oil is intimately mixed with a highly pulverized filtering material. After the required degree of decolorization has been obtained, the filtering material is separated from the oil by filter pressing. The development of these finely powdered filtering materials is a very interesting story in itself.

There are two general classes of finely powdered filtering materials in use at the present time in the California lubricating industry. The first class is that of the natural earths or "clays" as they are usually called. There is no essential difference between these filtering materials and the usual forms of fuller's earth. The former is simply highly pulverized and the latter is granular as this is the form which the mineral oil industry has been demanding for many years. There are several advantages attached to using natural filtering materials in powdered form. One of these is that the "fines" left over from the grading of granular filtering materials can generally be bought at a considerably lower price than the carefully graded granular material. Another advantage is that there are many highly adsorptive clays and earths which are not hard enough to maintain a granular form without an excessive amount of dusting. Others will not stand up in granulated form at all but break down immediately when put into a percolating filter, the weight of the column being sufficient to crumple all the clay near the bottom and thus sealing the filter. These highly adsorptive and therefore valuable clays can be readily used in powdered form instead of in the customary granulated form. One of California's largest manufacturers of lubricating oils has been using a natural filtering clay for several years in powdered form.

Better Than Fuller's Earth

The second class of powdered filtering materials being used in the California lubricating plants consists of clays which have been given a high adsorptive power by chemical treatment. These clays have little or no filtering value in their natural state. However, when properly treated they develop a filtering value from three to five times as great as the best natural fuller's earths mined on the Atlantic seaboard.

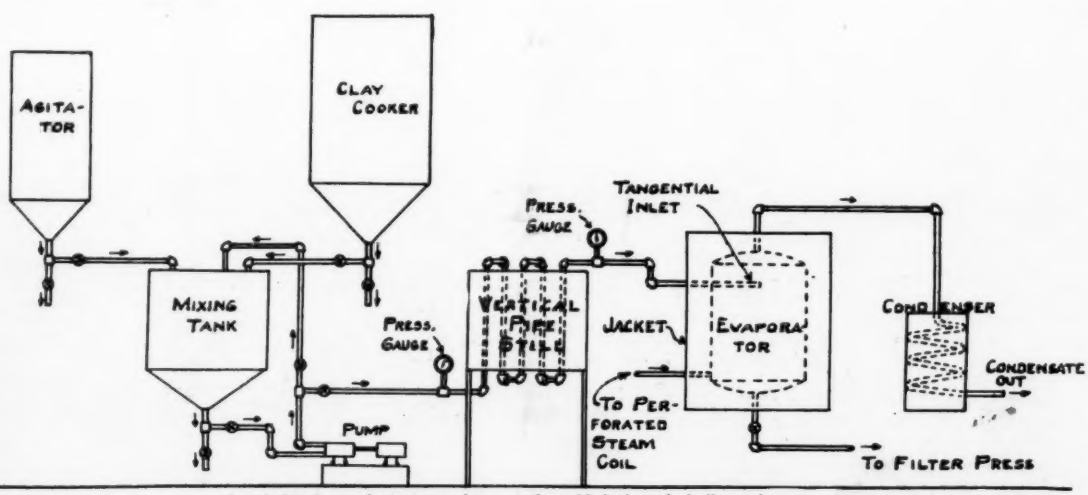
The use of powdered filtering materials is of course not new in the petroleum industry. While American practice has favored the almost exclusive use of granular materials other countries have used both systems.

When powdered clays began to be used in California on a commercial scale refiners borrowed the methods of the vegetable oil industry and simply mixed the filtering material with the oil to be decolorized in an agitator and then slowly agitated the mixture while it was being heated with steam coils. These agitators were open to the air and the mixing of the oil with the clay was also done with an air jet. Thus the temperature to which the oil could be heated was distinctly limited by the oxidation caused by the air. With most oils if the temperature was carried much above 200 degrees F. the darkening in color caused by the air was greater than the improvement effected by the clay treatment.

First Improvement

The first improvement upon this crude method of treatment was the introduction of mechanical mixing. This was accomplished by circulating the cold oil mixed with clay through a tubular heat exchanger. In this way the air agitation was done away with. A still later improvement was the closing of the top of the agitator. Now the treating system was air-tight and it became possible to heat the oil to very much higher temperatures. Oils have been treated at temperatures as high as 600° F. in this type of apparatus. As a matter of fact the only real limit to the height to which the temperature can be carried is the point at which the oil begins to crack objectionably.

When using high temperature treatments a slight amount of cracking is difficult to avoid except when operating under very carefully regulated and now patented conditions. This slight



A suitable form of apparatus for use of mudded clay of similar pulps.

cracking is, however, not necessarily a draw back. The oils treated with clay at high temperatures have a peculiar odor all their own. This odor is not objectionable but it is characteristic and since the trade is accustomed to the odor of the oils treated and filtered in the ordinary manner it is desirable to steam-reduce high temperature clay treated oils after filter-pressing. In this way the characteristic odor is removed and a quantity of light distillate taken off. This distillate consists largely of the lighter products of distillation brought over with the original untreated lubricating distillate and therefore contains a large proportion of cracked bodies which if left in the finished oil would cause color instability.

While discussing instability and air-oxidation it might be well to mention that several serious attempts have been made in California during the past few years to use scrubbed flue gasses in place of air for agitating purposes. The idea was, of course, to eliminate the oxidizing effect of air. This line of endeavor does not seem to have been particularly successful.

Use of Mudded Clay

All the recent lines of development in the manufacture of lubricating oils in California which have just been discussed have to do with the variation of some already well known method of treatment. For instance centrifuges are being used to cut down the setting time in water washed oils, powdered filtering materials are being used instead of the granular ones (both of them accomplishing the same ultimate result), pump circulation is used instead of air to reduce the oxidation of lubricating oil undergoing a filtering process. All these are simply modifications of well-known processes.

During the past year, however, a process has been commercially offered in California which is revolutionary both in what it accomplishes and the way in which it does it. This process is based on the use of a filtering material in mudded form and it does away with the chemical neutralization, washing, drying and filtering of lubricating oils as it replaces all these manipulations with one operation. This process will be described in some detail below as the writer is of the opinion that it represents the latest important development in California oil treating methods.

The first thing which must be borne in mind in connection with the above mentioned Mudded Clay Process is that it is really the combining of the latter halves of two processes into one. To explain, in the preparation of artificial filtering materials from clays and earths which in their natural state are inert it is necessary to treat the ground raw clay with a dilute acid. The acid generally used for this purpose is sulphuric. After the acid treatment is complete the reaction products are leached out of the mass by washing with water . At the termination of the water washing the treated clay settles from the water in the form of a mud. Now in the method of procedure which has heretofore been used this mudded clay has been put through a filter of suitable design and a large proportion of the water removed. The lumps of partially dried clay have then been further dried. As they dried they were broken up into smaller pieces and finally were pulverized and sacked for use.

Drying and Pulverizing Eliminated

The drying and pulverizing of the mudded clay has always been an expensive part of the preparation of treated filtering clays. This can now be eliminated by the use of the clay in its mudded form. Incidentally the use of mudded clay is not limited to artificial clays. The process is equally applicable to natural clays. There are many such clays which slack readily in water. Therefore their use in mudded form is considerably less expensive than grinding.

The statement just made to the effect that the use of mudded clay in lubricating oil refining constitutes the combining of two processes into one is now obvious. The drying and grinding of the clay is combined with the neutralizing, washing, drying and filtering of the oil. This is accomplished by mixing the acid treated oil while still in an acid condition with the mudded clay and dehydrating the mixture in a suitable tubular furnace. All the treatment which has been given the oil up to the time when it is mixed with the mudded clay is the regular dosage of acid which would have been given it under the usual treating methods. This acid treatment is then followed with a water knock-down or any other desirabe knock-down for the purpose of precipitating the finely divided suspended sludge. Thus the oil at the time when it is mixed with the clay is wet and fairly high in organic acids. Most of the free sulphuric acid has naturally been leached out in the knocking-down process.

The figure accompanying this paper shows a suitable form of apparatus for the use of mudded clay in oil treating. The mud and wet acid oil are mixed through a nozzle or else are emulsified in a third vessel. The intimate mixture is then pumped through a tube furnace. In the illustration this furnace is shown with vertical tubes. This form of construction is preferred because the danger of mud adhering to the walls of the tubes in the heated area is practically eliminated. A horizontal tube furnace is, however, equally satisfactory if it is calculated for a high velocity.

The mixture of oil and mud must be heated to a temperature sufficiently high to evaporate all the water. The higher the temperature is carried beyond this lower limit the greater will be the purifying and decolorizing effect of the clay. The upper temperature limit is the point at which an undesirable cracking effect is obtained.

After leaving the tube furnace the mixture is discharged into an evaporator chamber. Here the steam (evaporated water in the mixture) and light oil vapors pass out of the top and into a condenser. The lubricating oil and dry clay drops to the bottom of the evaporator. The clay is a fine powder at this stage of the process and is intimately mixed with the oil. It is here that the reaction between the clay and oil takes place as the clay has no adsorptive power as far as the oil is concerned while it is in the original mudded form. Live steam is supplied through a spider at the bottom of the evaporator. This serves to further mix the clay and oil and also "sweetens" the later by distilling from it all malodorous cracked products.

From the evaporator the mixture of oil and dry clay is passed through a tubular cooler and from there goes directly into a filter press. The filter press removes the clay in the form of a fairly dry cake. From this cake the clay can be recovered at a satisfactory efficiency if desired. The oil leaving the filter press is dry, of good color, and filtered to any commercial color desired. By this process it is possible to meet any governmental or commercial acidity specifications. This is because the clay, if properly chosen and used in an appropriate temperature, will selectively absorb organic acids as well as other impurities as well as removing those bodies, proto-asphaltic or whatever their nature may be, which are accountable for the color of lubricating oils.

Efficiency a Feature

One of the outstanding advantages of the use of high-powered filtering clays in mudded form is the very high efficiency which can be obtained. This is particularly true of artificial filtering clays. It appears that these highly adsorptive clays take up gasses and vapors from the atmosphere and by so doing diminish their adsorptive power for the impurities to be removed from oil. For instance, a clay which has no filtering value at all is acid treated and water washed. It is subsequently dried and powdered. Immediately upon completion of the process it has an efficiency of say 5.5 times as great as that of a standard sample of natural fuller's earth. After the clay has stood in sacks exposed to the atmosphere for a period of two or three months another efficiency determination is made. It will be found that the efficiency as compared with the same sample of fuller's earth will be in the neighborhood of 3.3 instead of 5.5. The 3.3 efficiency apparently is a saturation point with a number of representative California treated clays because upon more prolonged standing further diminution of value is not noticed. The most logical explanation for this phenomenon is that air or its constituents or impurities are absorbed in the finest recesses of the adsorptive clay particles. After these very finest recesses are saturated no further quantities of these gasses are taken up. The point is, however, that when the clay which has been exposed to the atmosphere is used in oil refining a double deleterious effect is obtained which nullifies to a considerable extent the beneficial effect of the clay treatment of the oil. In the first place the finest pores of the clay are already full of adsorbed material and therefore are not available for the adsorption of impurities which are to be removed from the oil. In the second place, air oxygen which has been adsorbed by the clay cannot help but have a had effect on the oil with which it is brought into contact. Because of the two effects just noted there is obviously a distinct advantage to be

(Continued on page 18)

Effects of Applying Vacuum to Gas Flow

Plants should be designed to handle gas produced at atmospheric pressure with gradual vacuum increase

By Harry Pennington

THERE is a tendency in casing-head gas gathering plants toward limiting the vacuum placed upon wells and this article is to discuss the effect of vacuum upon gas producing wells.

While the effect of vacuum in any field is toward an increase in production of oil, low boiling point oil fields must be handled different from high boiling oil fields. For that reason, this article will treat only of fields producing low boiling point or volatile oil.

Physical Composition

Perhaps an outline of fundamental physics of gases including air would assist in this analysis. Air is included since it is a gas, and an appreciable amount of air is handled through gasoline plant systems.

Gases display perfect elacticity, or resistance to compression or extension, and power to regain its form or bulk when the pressure or tension is withdrawn. And, further, gases possess a tendency to expand into a greater space as the pressure or tension is reduced, in consequence of repulsion between molecules. This is exhibited in the increasing rarefaction of the atmosphere in ascending from the surface of the earth.

The atmosphere, like all other bodies, gravitates toward the earth and consequently has pressure and weight. The pressure or tension is measured by mercury or water columns, manometers, barometers and gauges for indicating pressures below atmosphere.

In gasometry various standards are used such as a mercury column or water and pressure per square inch. Since the actual force exerted by the atmosphere is proportional to gravity attracion, all readings below atmospheric pressure are referred to a common datum plane which is sea level. Another method of setting up readings is to base them upon absolute zero, when 20 inches of mercury of vacuum becomes 10 inches absolute or within 10 inches of absolute zero pressure.

Gauges are made that register absolute pressures, read directly, without reference to barometric pressure. In fields of some altitude this type of gauge affords exact readings from the mercury column and is not affected at any altitude or in any weather by changes in barometric pressure.

The normal unit of pressure, English system, is 14.7 pounds per square inch, corresponding to 29.922 inches of mercury in the latitude of Paris; various latitudes show a slight variation.

When the mercury column reads 20 inches, the pressure in pounds of the atmosphere would be:

$$\frac{H}{29.922} = \frac{p}{14.7}$$

$$H = 2.0355$$

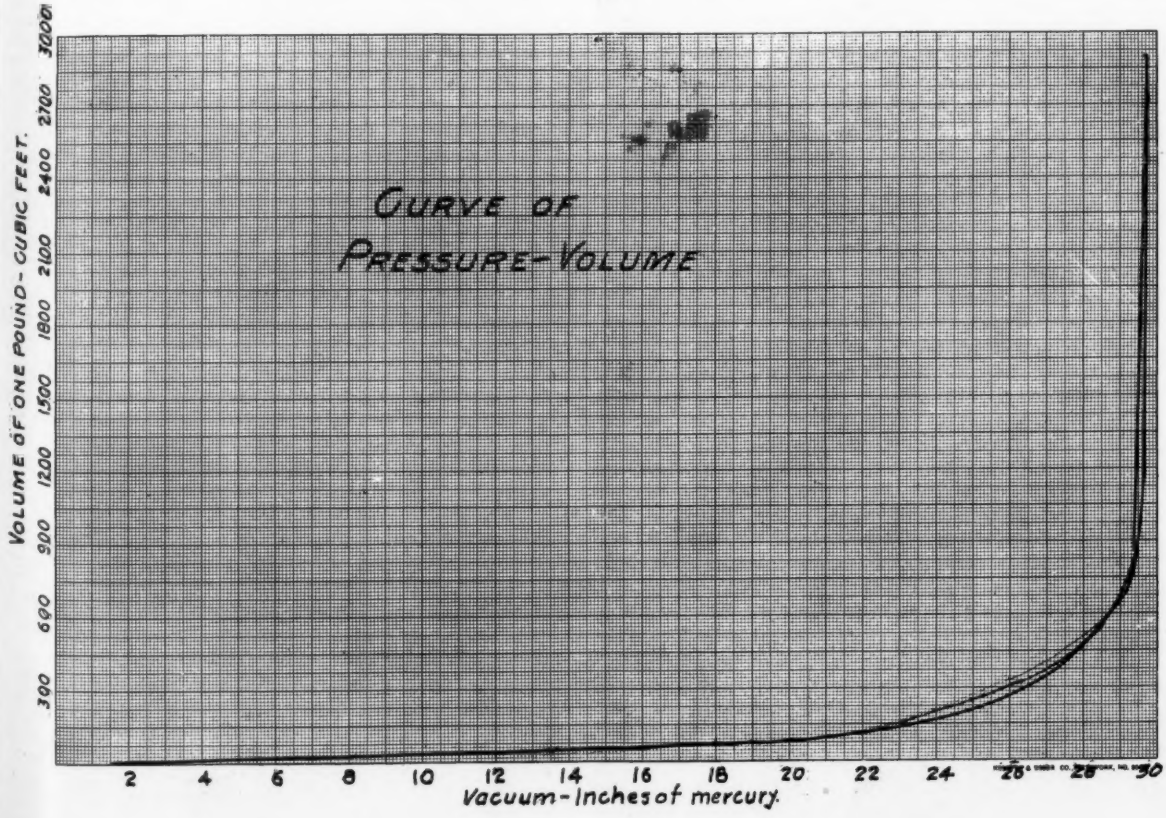
and $p = 0.4915\ H$ lb.

Then: $p = 0.4913 \times 20 = 9.826$ lbs.

The result, 9.826 pounds is, therefore, the pressure above absolute zero of pressure. From this, we can see that the pressures with which we deal below atmosphere are very small and, considered in the light of pressure alone, upon solids or liquids, little force is present.

Since 14.7 pounds is the pressure above absolute zero, 161.7 pounds absolute pressure would be 150 pounds gauge, which is eleven atmospheres above absolute zero.

The first law of the relation between



The Neodesha plant of the Standard Oil Company of Nebraska, which is one of the most modern refining units in the country.

tension and density of gases was discovered by direct experiment upon gases by Boyle, and more accurately performed by Mariotte, consequently is termed Boyle's or Mariotte's Law. It asserts that if the temperature be constant, the volume, the column of gas (perfect) varies inversely as the pressure. That is, by doubling the pressure, the volume is halved and trebling the pressure, volume is reduced to one third.

Then P $\times$ V=C=constant.

As an instance, gas in a cylinder 24 inches long open to atmosphere is at an absolute pressure of 14.7 pounds per square inch. When the piston is depressed 12 inches, the pressure is:

24—12=12.

14.7$\times$24

12 =29.4 pounds per square inch, absolute or 14.7 pounds above atmosphere.

The temperature of gases has an important effect upon the density and tension of gases. Discovered by Charles, published by Dalton and independently by Gas-Lussac, the physical law covering may be stated as follows:

A gas under constant pressure expands by a definite fraction of its volume at 32 F. for a given increase of temperature, or, for the same density the tensions, the volume of one and the same quanity of gas increases with the temperature.

An average value of many experimenters is that the expansion of a gas between 32 F. and 212 F. is 0.3665 of its volume at 32 F. This value varies considerably in liquifiable gases, however, since the density of such gases increases when the liquifaction point is neared, and this article deals for the most part with this class of gases.

Gases combine, according to Gay-Lussac, in very simple relation by volume, and Avogadro's Hypothesis, generally accepted by physicists and chemists, that, "Equal volumes of all the gases, elementary and compound, under the same conditions of temperature and pressure, contain the same number of particles or integrant molecules.

Since gases expand upon reduction of pressure, a study of the effect of expansion is here included. When a gas is expanded and its temperature is maintained, the expansion is termed isothermal, represented by a line showing relation between volume and pressure with constant temperature.

And, during expansion (or compression) when a gas neither receives nor rejects heat, then the curve which gives the relation between its volume and pressure is termed an adiabatic curve.

Expanding gas may do work; work is mutually convertible with heat, and, if no heat is supplied to the gas, while heat is being taken from gas doing work, then the gas necessarily cools in exact proportion to the work done. This has an important effect upon temperature in oil and gas sands.

A distinction should be made here, covering free expansion. Joule immersed two vessels connected by a pipe in a vessel of water, one of the vessels was filled with air at 22 atmospheres and the other exhausted of air. Opening a stop cock, air rushed from one vessel into the other, but no apparent change of temperature was observed. Hence Joule's Law, "When a gas expands without doing external work, and without taking in or giving out heat, its temperature does not change." Expanders depend upon this principle.

Now, applying the foregoing notes on physical chemistry to wells.

Practical Application

When the well flows during initial production, usually such flow is caused by pressure upon the sand from water below or on the sides. This pressure from water has of course, generated rock pressure in the sand and may have been sufficient to have liquified some of the hydro-carbon gases and dissolved others into the oil, and, when pressure is released, some of the gases so liquified and dissolved are converted into gas again. It is certain that some of the lighter gases do come out of the oil upon reduction of pressure. Many observations in the field point to this, although several authorities assert that vacuum or reduced pressure has no material effect upon oil.

A tank of freshly run crude of 105 F. initial boiling point, from a large flowing well, making large volumes of gas, was cut off from the flow line and the bubbles removed from the top. The oil level in this tank subsided ¾ inch in two hours, with no leaks and the tank held 2½ barrels per inch, about. Many pipe lines have a rule that tanks will not be run until 24 hours after being cut off from the flow line for this reason.

In wells making "live oil" that is, oil of low boiling point, with much gas, a bailer picking up oil from the bottom under a column of such oil, will not emerge full, due to expansion of gas coming out of such oil.

By way of diversion, the boiling point of oil in the Engler apparatus does not reflect the true boiling point, and the difference may upset calculations on tension.

It seems that oil must be agitated to relieve gases. Oil pumped from one tank to another loses gravity due to loss of lighter fractions. Flow lines, dropping oil from a height into the tank, as compared with lines terminating under the surface of oil, retain light fractions. Gasoline, shaken in an open container, evolves gas and lowers the gravity.

Vacua applied to low boiling point oil evolves gas. The old type of gasoline engine, without carburetor, received gas evolved from the surface of light gasoline.

Pumps handling light oil under pressure in pipe line work have never been fitted with simple air (or gas) chambers for cushioning, because air or gas in such chambers dissolves or liqifies into such chambers dissolve or liquifies into Air pumps to supply such chambers must have considerable displacement to maintain a cushion.

That gas is evolved at the surface or within the body of oil depends upon whether such gas is liquified or held in solution. Surface tension as against tension at the bottom of a column of oil evolves more gas upon reduction of tension and gases so evolved are heavier.

The many phenomena observed above ground, as set out above, and there are many more, have a bearing upon what occurs in a sand below ground.

When the well flows during initial production, usually such flow is caused by pressure upon the sand from water below or on the sides. This pressure may have been sufficient to have condensed some of the gases into liquid with the oil and to have dissolved others with the oil and, when the pressure is reduced, some of the gases so held in the oil and evolved. That this occurs is certain.

As oil containing gas, traveling up the casing, nears the surface, the volume of gas increases due to expansion from pressure reduction. Gases so evolved and expanded necessarily occupied a smaller volume at the bottom of the well. Flowing wells differ materially in gasoline content of the gas,

(Continued on page 31)

Finding Gasoline Content of Crude

New method used by one company giving good results—easy to operate

By S. E. Campbell
*Chief Chemist, Associated Oil Co.**

Many methods and different types of apparatus have been suggested from time to time for the purpose of determining the amount of gasoline obtainable from crude petroleum. With gasoline such an important commodity as it is today, and with the amount of crude petroleum being produced, ability to determine the yield of gasoline obtainable from it, or the amount of this product obtainable from "tops" or other distillates, accurately and with the minimum amount of time, is highly important both to the refiner and to the buyer and seller, especially where the transaction involves large quantities. This is particularly important inasmuch as the sales value of these transactions frequently depends upon the amount of gasoline obtainable from the product under negotiation.

The term gasoline is used by the average individual to designate a definite petroleum product. The word, however, does not entirely describe that product of petroleum to which it is applied, as there are many different products, all known as gasoline, which vary widely in both physical and chemical characteristics. We will however consider gasoline to be that portion of crude petroleum boiling at temperatures not in excess of 437 deg. F., at atmospheric pressure, this being the maximum boiling point specified by the U. S. Government for motor gasoline.

In making this determination, many different types of apparatus are employed. In many cases stills of approximately one gallon charging capacity, equipped with suitable condensers are used for "topping" crude. Such stills are usually not equipped with fractionating columns, although they may be supplied with domes which accomplish very slight fractionation. The condensers used vary widely and may be of the worm type or similar to a glass Leibig condenser, ice water being used for condensation or in some cases water at the temperature of the ordinary supply system. This equipment is used for 'topping" the crude, or in other words, distilling from it that portion which is volatile at temperatures below 500° F. to 550° F.. There are many modifications of this type of still and condeser used for approximately the same purpose.

Where such equipment is employed for "topping" crude, the "tops" are redistilled either in some form of metal still, perhaps equipped with a fractionating column, or in glass distilling flasks. With these latter, fractionation is frequently accomplished by filling the neck of the flask up to the sidearm with beads, jack chain, or equivalent packing. In the redistillation of "tops" ice water is usually employed as the condensing medium and the receiver is maintained in a bath of ice water, especially at the beginning of distillation, to minimize losses by evaporation.

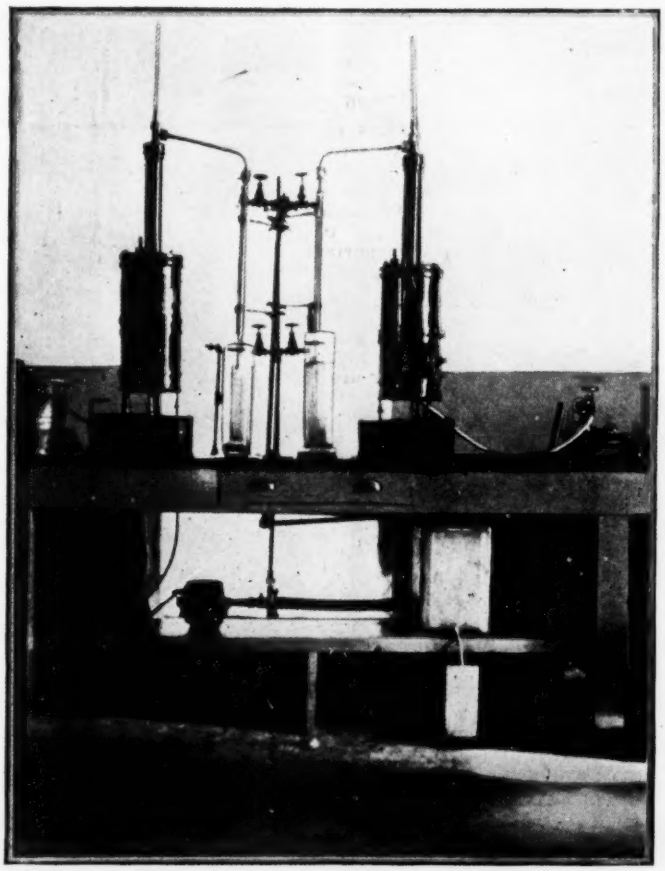
The equipment illustrated on the opposite page and described below, has been in use for some time in this company's laboratories and has been found to give such excellent results from the standpoint of accuracy, ease of manipulation, and great saving of time, that it was thought it might be of interest to readers of The Record. It will be noticed that the still setting, which is of sheet iron, is equipped with leveling screws to facilitate accurate charging of the still and measuring the volume of the residuum by gauge should this be found necessary or desirable. The still itself is of pressed steel one-eighth inch in thickness, having a total capacity of approximately 3,000 cc.

To the top of the shell is welded a flange carrying six stud bolts. The joint between the still head and the still proper is so made as to secure metal to metal contact of very thin secdinary gaskets which are always more or less troublesome and after relatively little use have to be removed.

The still head has in its center a two-inch opening into which a 14-inch fractionating column is fastened, the same type of joint with copper gasket being used, as mentioned above. The fractionating column may be packed with any suitable material. In the writer's experience, steel tubing one-fourth-inch in diameter, cut in one-fourth-inch lengths, having a wall thickness of one-thirty-second inch, has been found very satisfactory. Quarter-inch diameter glass beads or small iron chain, may however, be used with equivalent efficiency.

The conical cap at the top of the column is removable for cleaning or for attachment to a column of different height. In the top of this cap a thermometer is installed so that the bulb comes into direct contact with the vapors passing to the condenser. It will be noticed that the vapor line leading from the tower to the condenser is provided with two connections to facilitate packing should the apparatus have to be transported. As illustrated, the still is heated by means of a gas flame, but an electric heater may be found preferable.

Two different types of condensers both of which are illustrated, have been used with this equipment. Condenser E has been designed for maximum efficiency. By reference to the illustration it will be noticed that the vapor is passed down through the condenser spirally and that the condensing medium is also passed in the same man-



New experimental gasoline distillation apparatus designed at the Avon Refinery of the Associated Oil Company. The small pump on the bench under the table is driven with an electric motor and circulates ice water through condensers. Figure 2 gives a sketch outline of the other equipment.

*Reprinted from "The Record".

ner upward and counter current to the vapor. The tube at the bottom of he condenser is equipped with a removable curved tip which conveys the distillate against the wall of the receiver. Graduated cylinders of 500 cc. capacity with ground tops have been found very satisfactory. The receiver is immersed in a bath of ice water to minimize evaporation loss.

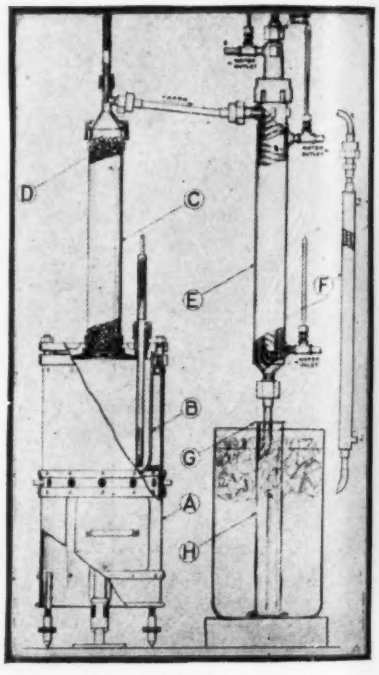
With gasoline, the lag or distillation losses caused by the spiral in the vapor space has been found to be negligible in the majority of cases. However, where the results desired depend upon recording the amounts distilled at various temperatures, this condenser lag may interfere with extreme accuracy, in which case condenser F is used. This consists of a brass tube 20 inches in length, inside of which is permanently fastened a straight copper tube five-sixteenths inch in diameter to which is attached a thin metal spiral, closely fitting the condenser jacket. The condensing medium is introduced at the bottom and passed upward spirally counter current to the oil vapor flow. It has been found that with such a condenser distillation losses do not exceed one-half of one per cent.

This new equipment has been found to possess the following advantages:

It saves a great deal of time by doing in one distillation what formerly required two distillations. The time now required for the complete cycle is less than one and one-half hours. This reduction in the time required allows prompt reports for sales or purchase transactions. The equipment is highly accurate when properly operated. It is extremely flexible, since the fractionating tower can be changed in height, depending on the efficiency of fractionation desired. The apparatus is easy to handle, eliminates leaky joints, and the breakage of glassware. It is easy to operate, it is readily protected from drafts, and can be easily cleaned and inspected.

This equipment was developed to facilitate the examination of a large number of crude oil samples for gasoline content and to make it possible to supply such information in the least possible time.

In using the apparatus for determining the gasoline content of crude oil a charge of 1000 cc. of the sample has been used. Increasing the amount to 2000 cc. has been found to give equivalent results. One thousand cc. provides ample outage in the still, which, together with the tower capacity, permits the examination of samples containing as much as three per cent water without taking any of the usual precautions to prevent "puking" when water is present in sufficient quantities to cause it. Samples containing more than this quantity of water have not been run, but it is probable that examination can satisfactorily be made when considerably more than this is present.



Close up view of equipment. (a) Still setting. (b) Shell enclosing still. (c) Fractioning column. (d) Tower packing of Rasch rings. (e) Spiral condenser. (f) Straight tube condenser interchangeable with (e). (g) Metal disk to prevent evaporation loss. (h) Graduated receiving cylinder.

It has been usual to maintain a distillation rate of 10 cc. per minute, using water as the condensing medium, maintaining the temperature of the inlet water at 34° to 36° F. The 500 cc. graduated receiver is held in a glass receptacle containing ice water.

In making examination of a sample of crude oil the procedure is briefly as follows:

The still is first thoroughly cleaned

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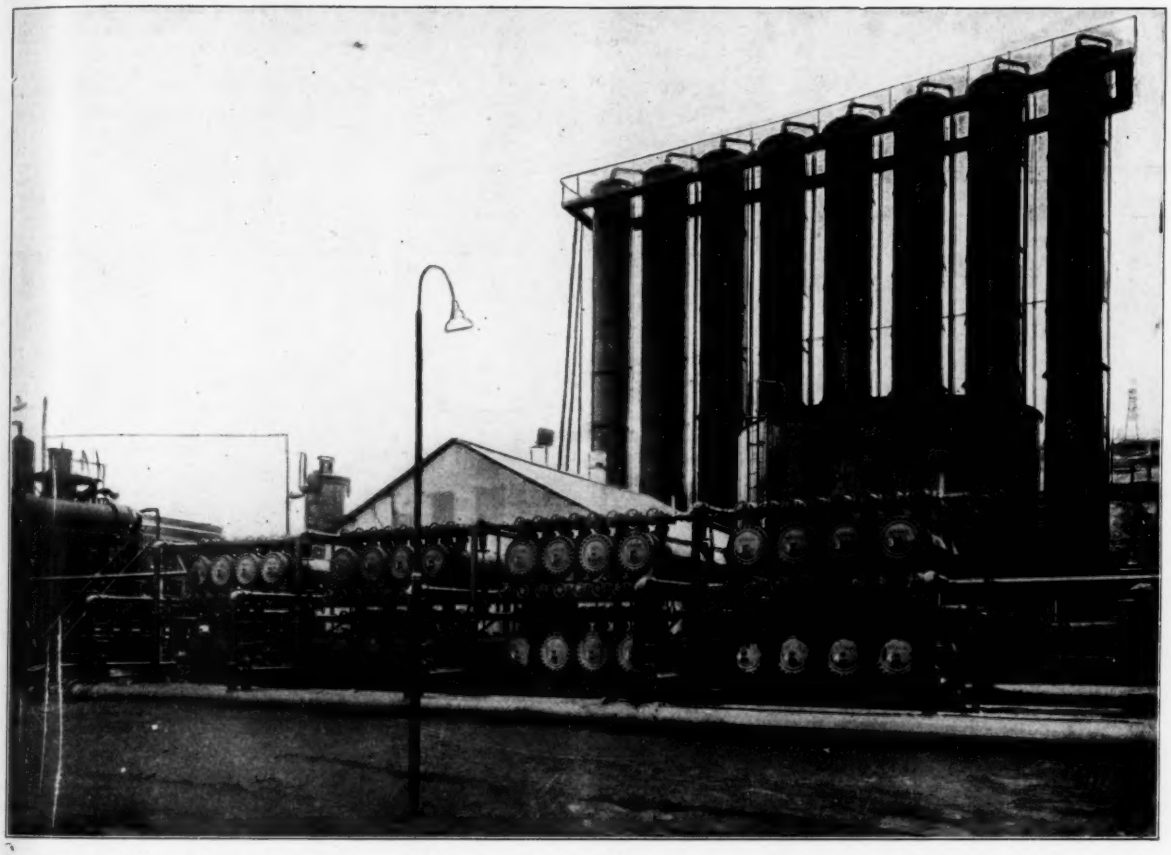

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and charged with 1000 cc. of the oil. The still head is replaced and all joints made thoroughly tight. Heat is supplied by means of a gas burner, the flame being so regulated as to have distillation commence within 10 to 15 minutes after lighting the burner. After distillation has started, the burner is so regulated as to maintain a distillation rate of 10 cc. per minute. This is continued until the temperature of the vapor passing to the condenser has reached 437° F., when the burner is shut off. The distillate is then carefully and thoroughly mixed and a sample of it is distilled by the standard A. S. T. M. method for determining the boiling point range of gasoline. Due to the natural variation in the constitution of crudes it is not always possible to exactly obtain gasoline having an end point of 437° F. when following the above procedure and it is therefore sometimes necessary to repeat the distillation to obtain this desired end point.

The gasoline obtained from some crude oils naturally conforms to government specifications for motor gasoline, while in others the gasoline obtained may be deficient in the lighter fractions and in order to use such a product it is necessary to blend with it gasoline which contains these low boiling constituents. It will be seen that this apparatus offers a ready and safe means of accurately determining the amount of gasoline obtainable from crude oil and examination of the distillate shows its physical characteristics.

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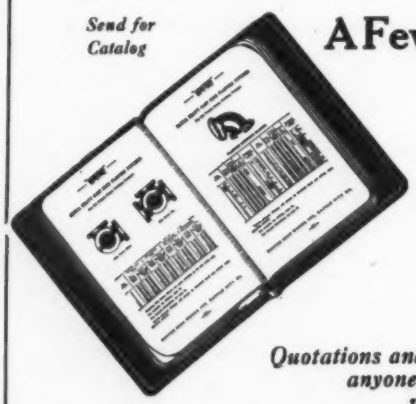

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Methods of Treating Lubricating Oils

(Continued from page 12)

gained by keeping the filtering clay out of contact with the air. This is accomplished by keeping it in mudded form until it is used.

The foregoing will suffice to outline the objects and method of procedure of the mudded clay treatment. It is believed that this distinctly California development will ultimately have a national effect in the manufacture of lubricants. It has already been adopted for use in France.

New Development in Artificial Filtering Materials

On April 29, 1924, a patent was granted to James W. Weir and John C. Black for the production of a new filtering material for use primarily in the manufacture of lubricating oils. These inventors are well known California refiners although John C. Black for several years transferred his activities to Mexico and Louisiana. This filtering material on which a patent has been granted is produced by the acid treatment of inert clays and earths and the main point of difference between their procedure and that already established is that the products of the reaction between the sulfuric or hydrochloric acid used and the earth are not washed away with water but are purposely left with the clay or earth. Another difference between their process and others is that they claim to add only sufficient acid to produce the salts of the acid reaction which they find beneficial. The proportion of caid used for this purpose is claimed to be less than 10 per cent. The inventors state that they do not know the reason why these salts (reaction products) should produce the beneficial effects claimed for them. The advance the opinion that "It may be, however, an action similar to the action of similar salts on water containing suspended matter or colloids whereby they are coagulated or precipitated, thus clearing the water of the impurities."

Discovery of High Powered Natural Clays

While this development has been going on in the field of artificial filtering materials a parallel search for improved materials has been made by the prospectors. A number of deposits of highly interesting adsorptive materials have been discovered in the desert regions of California and southwestern Nevada. Some of these natural filtering clays have efficiencies as high as three or four times as great as the best eastern fuller's earths. The deposits are readily worked and aside from the inhospitality of the regions in which they lie represent no inordinate difficulties to exploitation. Rail shipping facilities are available within reasonable distances.

Just what effect the marketing of these high powered clays will have upon the further development of processes for the manufacture of effective artificial filtering materials is not known at the present time. There is little doubt, however, that there will be some severe competition between the two lines of endeavor. This competition need not be exterminative for either side, though, as some of the treated clays can be used for the se-

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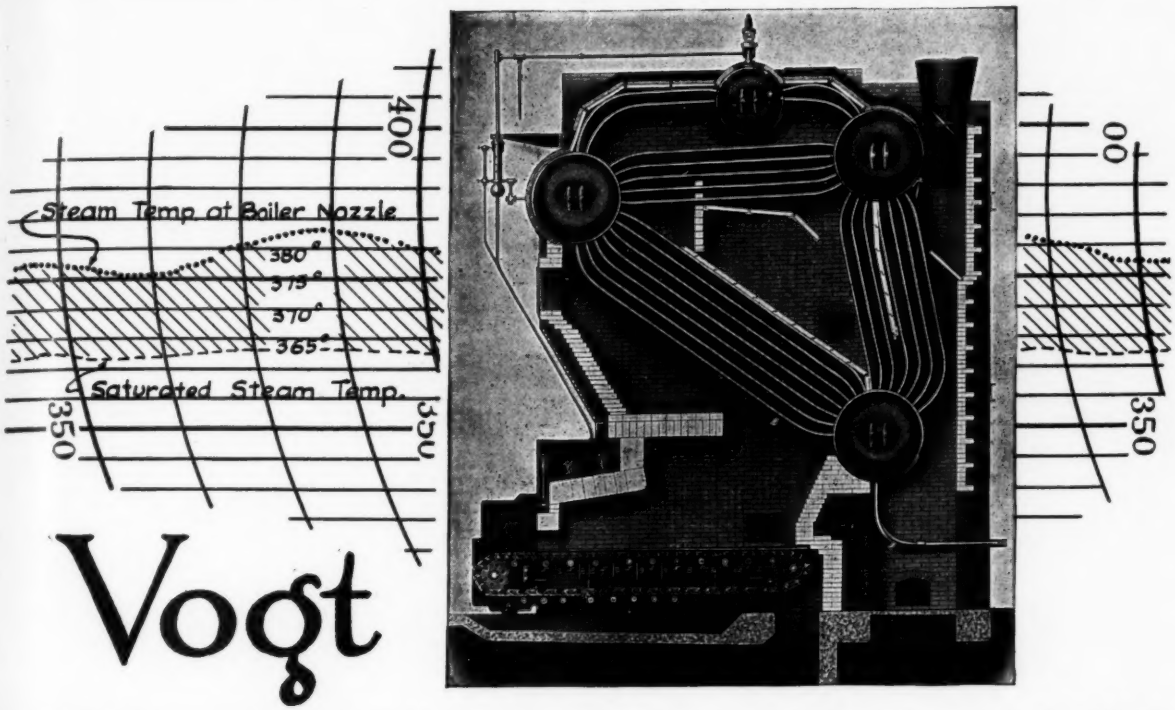

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It is a universally known fact that superheat increases the economy of all steam driven prime movers. And it has also been repeatedly and conclusively proved that the first few degrees of superheat are by far the most important — that the gain in efficiency by the use of slightly superheated steam instead of steam containing moisture is out of all proportion to the difference in available energy. Only a slight superheat is necessary to eliminate the waste of drips and greatly reduce line and cylinder condensation.

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lective adsorption of certain impurities which are only indifferently removed by certain of the newly developed natural clays, and vice versa.

Judging from the foregoing it is easy to see that much of the recent research in California along the lines of lubricating oil manufacture has been devoted to the development of more satisfactory filtering methods. It is not necessary to search far for the reason. The old established lubricating oil treating methods involving the soda-neutralizing and thorough washing of the oil established large losses. Washing losses of twenty-five to thirty-five per cent. were not uncommon in the case of motor oils. Everybody knew that only a very small proportion of this loss represented actual impurities which it was necessary to remove. The balance of the so-called soap water which was drawn from the wash agitators was really perfectly good oil held in the water as a very fine suspension. Then in the drying of the oil by air-blowing another loss was sustained. This loss was not in quantity but in quality. Even the most careful regulation of the air temperature or rather the temperature of the oil at the time when it was blown with air it was impossible to prevent a certain amount of back-up in color. Consequently any new process which promised to eliminate some of these losses was given careful consideration.

Improved Distillation Methods

The treating of lubricating oils is, however, not the only phase of their refining which has come in for serious attention. At the present time most of the California lubricating oil refiners produce their distillates by a combination of steam and fire distillation. As previously mentioned one of the largest refiners is using combined steam, fire and vacuum distillation successfully.

Several years ago one of the big companies carried on an extensive research in so-called "direct-contact" distillation. A very satisfactory apparatus and method of operation were developed. The principle of the process was to bring the oil being distilled into direct contact with the combustion gasses from a furnace connected with the still. The temperature of the combustion gasses is moderated with steam or inert gas to a temperature sufficiently low to distill the oil without cracking. Cracking is further inhibited by the fact that the proportion of combustion gas to oil vapor is so great that the oil is really distilled under a partial pressure as low as can be obtained with the most efficient vacuum distillation. This is in effect the greatest argument for this patented process. Another thing in its favor is its very high fuel efficiency, this varying from 0.8 to 1.1 per cent of the crude charged into the still. It is entirely probably that even higher efficiencies can be obtained when operating in larger units than have been so far attempted.

The direct contact between the oil and the combustion gases is made possible by the careful regulation of the air required for combustion. If excess air is permitted to enter the furnace the result will be a distillate which has a "burnt" or oxidized odor. Actual combustion of the oil being distilled isn't possible because the combustion gasses entering the still are too low in temperature to permit spontaneous ignition.

This process is not in use at the present time because the company controlling it is not now a manufacturer of lubricants. The process is, however, available to others on a license basis. Its use is also contemplated by the controlling company when the latter engages in the manufacture of lubricants on a commercial scale. The development of efficient distillation by direct contact appears to have real possibilities and may be the means of still further differentiating California lubricating oil refining technic from that of the rest of the country in the course of the next few years.

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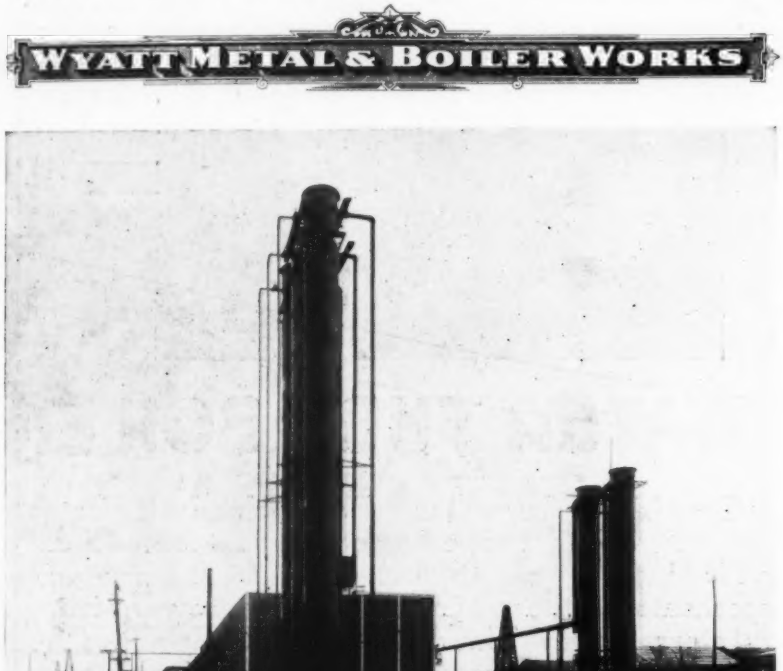

View of Baltic Gasoline Company's Plant, Ranger, Texas, Showing Absorbers

Another Wyatt's Dallas Equipped Absorption Gasoline Plant

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Wyatt Metal and Boiler Works

Dallas, Texas

Shell Still to Be Added To Refinery at Pioneer

Fort Worth, Texas.—Another shell still is to be added shortly to the American Oil Company's skimming plant at Pioneer in order to increase the gas line yield from crude run through its pipe stills. This plant is located in the heart of the Pioneer field in Central West Texas, and at present has an average daily capacity of 800 barrels of crude.

H. L. McKeehan, formerly vice president and sales manager for the Ansonian Petroleum Company, has been made sales manager for the American Oil Company, and headquarters are now maintained on the twentieth floor of the W. T. Waggoner building in Fort Worth.

Safety Features Part of Operating Plan

Many needless accidents occur at refineries and gasoline plants through lack of training

By A. R. McTee

A FEW weeks ago an employee working for a refinery in the Gulf Coast section, was injured by a hammer falling off a still. Somebody had left the hammer where the slightest jar would cause it to fall. The young man was working on the ground under the still and when the right jar came, down came the hammer. For a short time it was thought that the injury would prove fatal, but it merely resulted in a fractured skull.

Last week in San Antonio a group of men were working in a refinery. An electric wire that was swinging too loose was cut, a spark resulted and an explosion occurred, killing two men.

Contributory Negligence

According to the classification made by the Texas Petroleum Safety Council, both these accidents would be assigned to contributory negligence. In each instance, the men who suffered had nothing to do with the cause of the accident.

It is manifestly unfair and seemingly unjust for any workman to be injured from such a cause. The element of chance in life renders it impossible to remove all hazards from work and there will always be accidents where people are active. But with proper effort and methods, there is no doubt that the dangers from contributory negligence can be largely removed.

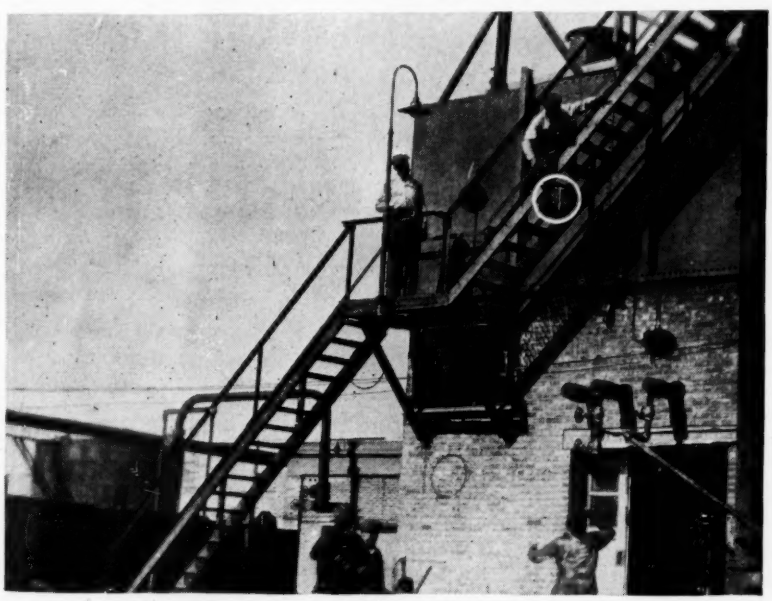
Who is Responsible

In accidents that occur from this cause, it is often, if not nearly always difficult to center responsibility. In the case of the hammer injuring the workman referred to above, it will probably never be known who left the hammer in the dangerous position. But there is no doubt about the fact that the person leaving the hammer where it could fall contributed to the accident.

The problem of making any one man responsible is difficult. Even the foreman cannot spend his time going about the plant after the different groups of workmen to see that nothing has been done to create accident hazards. However, he is a contributor to accidents if he fails to impress upon his men the idea of taking precautions—the absolute necessity for every man to think "safety" until the practice becomes as second nature to him. Therein is to be found the real remedy for accidents and the only dependable safeguard.

A workman might leave a hammer in a dangerous position and be utterly unconscious of the hazard he creates. But he ought to be instructed as to the danger that is necessarily involved where groups of men work together. An act that might be perfectly safe where one, two or three men are working, can easily become very dangerous where ten or fifteen men are congregated. This point ought to be made clear to the workmen, and it is evidently the task of the foreman to see that such matters are taken up with the men under him. A group discussion of dangerous practices might clear up many matters that would never be thought of otherwise. Such a discussion would probably reveal matters that even the foreman had not noticed, and the discussion would give opportunity for the workmen to bring up ideas of safety to apply in individual instances. If the foreman is not interested in such discussions, it is hardly likely that the men under him will be. And if the foreman is not encouraged in the idea of educating the men under him to safety practices in work, by the "higher ups," then something is wrong with the organization.

On the streets of a modern city, the other day, a traffic officer arrested a man for turning to the left at the wrong corner. The man declared that he did not know the traffic regulations, but such an argument did not excuse him in the least. He involved the safety of other drivers when he made a left-hand turn, and the law prevailed.



This picture shows a common, but dangerous practice. The man on the stairway does not always catch the hammer as it is thrown to him, and when the hammer falls back there is danger of some one getting hit.

Ignorance Not Excusable

This incident is cited to show that ignorance cannot be used justly to excuse actions that jeopardize the welfare of other people. Lack of knowledge of the danger involved in leaving the hammer where it might fall, probably accounted for its being left there. However this did not help the workman who was hit on the head, and it should be of much more importance to the safety department of the company to know who left the hammer in the dangerous position than to know that one of the workmen had been injured. The expense of taking care of the injured man was a great deal more than it costs to drill the men on the fundamentals of safety.

In other words, the ideal to be worked toward in safety work is to lead the workmen to think "safety" until it would be out of the question for one of them to leave a hammer where it might fall on somebody's else head. If every man could be made to realize that he may be the cause of accidents through contributory negligence, a big part of the problem would be solved. No normal being wishes to be a factor in the injury of his fellowman. When such happens, it is generally due to carelessness or ignorance. However, the contribution toward the accident is there, nevertheless, and the seriousness of the accident is not abated. Because the oil industry presents the great number of hazards that it does, it is doubly important that those who work in the fields and about refineries, think seriously on the meaning of contributory negligence and train themselves that they may not be responsible for accidents either directly or indirectly.

WELL KNOWN REFINER DIES

Wichita Falls, Texas.—S. M. Griswold, aged 58, president of the Griswold Oil Corporation and well known in refining circles in the North Texas district with a refinery at Electra, died suddenly May 23 at his home here. He is survived by his widow and one son, E. F. Griswold, vice president of the Griswold Oil Corporation.

Gasoline and Ignorance Will Not Mix

Recently when a tank car containing gasoline intended for further refining was spotted on a refinery track, two employes took charge of it, and prepared to unload the car. They had difficulty in starting the unscrewing of the dome cover, and were hammering it, when the general manager passed them, and noting what they were doing, advised them to put off unloading the car till the following day, as the afternoon was nearly gone. A few minutes later, returning, the manager found that the men had partly unscrewed the dome cover. At this moment, a shifter engine approached. Fearing ignition of vapors escaping around the dome cover, he told the men to screw it down till the shifter had passed. Noting that the gasoline seemed rather "wild," he again advised the two men to wait till the following morning before removing the dome cover. The employes, however, ignored this suggestion, and after the general manager had gone, they began to unscrew the cover once more, apparently taking no steps to ascertain whether pressure existed in the tank.

The conductor on the shifter, which had stopped several hundred feet away, suddenly saw a column of gasoline and vapor shoot up twenty feet in the air. The two men on the tank car tried to replace the cover, but of course could not do so. For five minutes the flow continued. There was no wind blowing; the gasoline vapors drifted slowly away from both sides of the tank. Some of this vapor settled beneath the nearby barrel house of the plant. Toward the other side, the vapor floated as far as the cracking plant, 95 feet away, and here, apparently, ignition of the vapor occurred. There was an instantaneous flash back to the car, followed by an explosion of the vapors which had collected under the barrel house. This building was blown to pieces; flying debris buried two women who were walking on a street along side the barrel house, killing one and seriously injuring the other. An automobile passing along the street 150 feet from the tank car was wrecked. Two empty box cars were destroyed and three empty tank cars badly damaged. The bodies of the two unloaders were found, one in the ruins of the barrel house, and the other on the ground about 40 feet from the tank car. After the fire was extinguished, the tank was found about one-third full of gasoline. Altogether, three lives and $35,000 worth of property were wiped out by this explosion.

Of course the immediate cause of the accident was the ignorance or recklessness shown by the two men who started to unload the tank. The entire responsibility, howevr, does not rest upon these two unfortunates, but a share belongs to the loaders of the car. In the first place, though billed simply as "gasoline," and shipped in a Class III tank car, the material was actually casinghead gasoline, and should have been loaded into a Class IV insulated tank. Secondly, although the loading company had recorded the vapor tension of this material as 5½ pounds at 70 degrees Fahr., their method of measuring this quantity was so faulty that the actual vapor tension must necessarily have been considerably in excess of this amount. Finally, in an endeavor to make the dome cover fit tightly two moulded asbestos gaskets had been used, instead of one, causing the stoppage of the vent holes in the threaded portion of the dome cover. Had these vent holes functioned properly, the whistling of the vapor issuing from them might have been a sufficient warning to the unloaders when the dome cover was partially unscrewed.

The waves of the ocean beating upon the shore have scarcely been more persistent than the steady reiteration of the rule that dome covers must not be removed while pressure exists in the tank; yet accidents from this cause continue to occur with distressing regularity. Obviously there are still many who have not been reached by this warning; the responsibility of management toward education of employes is clear.

Note—Reprinted from Bulletin of the Bureau of Explosives.

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Made in sizes to handle all the oil from Absorbers without the loss of any gas under any pressure and gravity and without any changes or adjustments.

These Traps do not become inoperative with oil and water.

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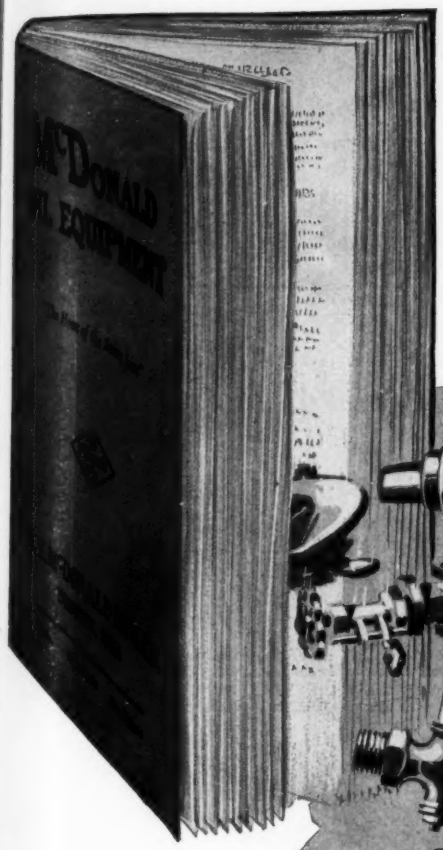

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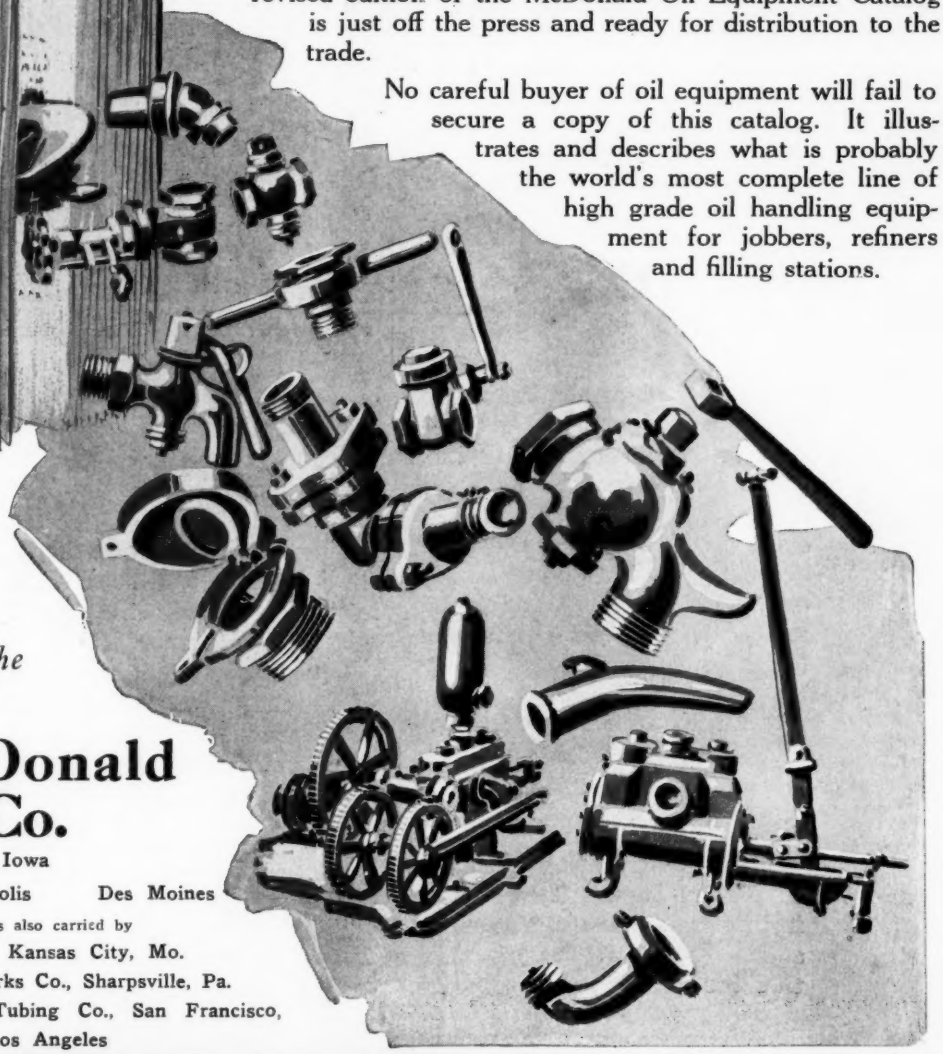
No careful buyer of oil equipment will fail to secure a copy of this catalog. It illustrates and describes what is probably the world's most complete line of high grade oil handling equipment for jobbers, refiners and filling stations.



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Condenser Box in Plant of Root Refineries, El Dorado, Arkansas

THE original installation in this box in the plant of Root Refineries, El Dorado, Arkansas, was of 2" steel pipe coils connected by cast iron return bends on very close centers. These coils filled the box from side to side and end to end, to within a few inches of the top. It was impossible for a man to get between them.

Sterling Condensing Sections were substituted for coils

The picture tells the story.

Note the room between the stacks. The Sterling Sections now in the box actually have more square feet of condensing surface than the coils. A man has plenty of room to move about with ease to clean, repair or remove units.

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The full facts about Sterling Sections are given in an interesting illustrated booklet. An inquiry will bring it to you.

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condense more quickly than coils,
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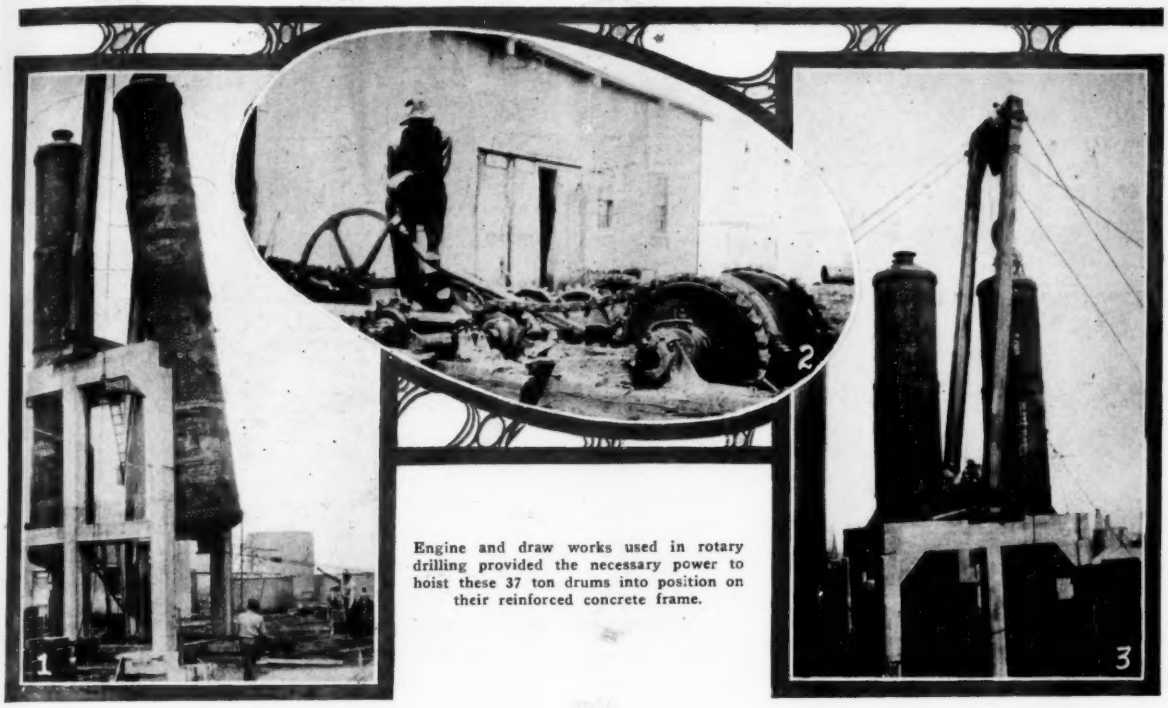

Engine and draw works used in rotary drilling provided the necessary power to hoist these 37 ton drums into position on their reinforced concrete frame.

Draw Works Make Good Hoisting Power

One refiner uses rotary well equipment to handle drums weighing 37 tons each

IN oil fields and about refineries the handling of heavy equipment quite often becomes a problem that taxes the ingenuity of engineers with long experience. Hoisting and lifting facilities are not usually available in new fields, especially. The demands of oil field work are such that sometimes materials of tremendous weights have to be moved over long distances, and it not infrequently happens that very heavy weights must be hoisted to considerable elevations. All this requires thought and most of all, practicability on the part of those in charge of the work.

A recent example of how successful improvised methods may be, is found in the way a pair of soaking drums were handled by the Humble Oil & Refining Company at its cracking plant, now in process of construction near Burkburnett, Texas.

Used Rotary Draw Works

The drums weighed approximately 37 tons each, were 40 feet long, and were six feet in diameter. To get them into an upright position on concrete foundations was no small sized task. A good deal of scheming was done when somebody happened to think of using a rotary draw works to pull the drums into place on the concrete pillars. The idea appeared sound and an engine and rotary draw works were borrowed from a nearby lease and set up near the cracking plant.

The draw works was placed flat and bolted to a well anchored foundation of heavy timbers, at a short distance from the reinforced concrete frame erected to support the drums. The engine was placed directly behind the draw works. Spliced timbers, sized 14" x 14", with a connecting cross-arm at the top were set up on top of the concrete foundation to support the block and tackle and cables used in hoisting the drums.

When the outfit was put in place, less than 30 minutes were required to pull each of the heavy drums into position.

Use of Bauxite for Oil Refining Is Subject at Chemists Meet in London

(Reprinted from Chemical age (London), May 10, 1924, page 490)

AT the monthly meeting of the London Section of the Society of Chemical Industry, on Monday, May 5th, a paper was read by Dr. A. E. Dunstan and Mr. O'Brien of the Anglo-Persian Oil Company, in which some account was given of the experience of the research department of that company in the use of bauxite for oil refining and its technical application.

At the opening of the paper it was stated that the late Dr. John Hood, who was for many years a member of the Society, discovered some 50 years ago that bauxite, when applied in a particular way, was a refining agent of considerable value, and for many years the Burmah Oil Company, however, dated from June, 1918, when the first experiments were carried out. The bauxite was used in a granular form by the Anglo-Persian Oil Company and usually at a temperature of 200 degrees or thereabouts, and the peculiar feature was that the crushed bauxite, used in this way after roasting, acted as an effective decolorizer and also an effective desulphurizer. Moreover, experiments had shown the further peculiarity that decolorization took place first and was nearly completed before the desulphurizing action commenced. Again, it had been found that the bauxite was more effective when used hot than when used cold, and among the conclusions arrived at as the result of the work which had been done by the Anglo-Persian Oil Company were that bauxite was a colloidal adsorbent of the first order for removing sulphur as well as color, and that the fresher the preparation the more efficient the re-

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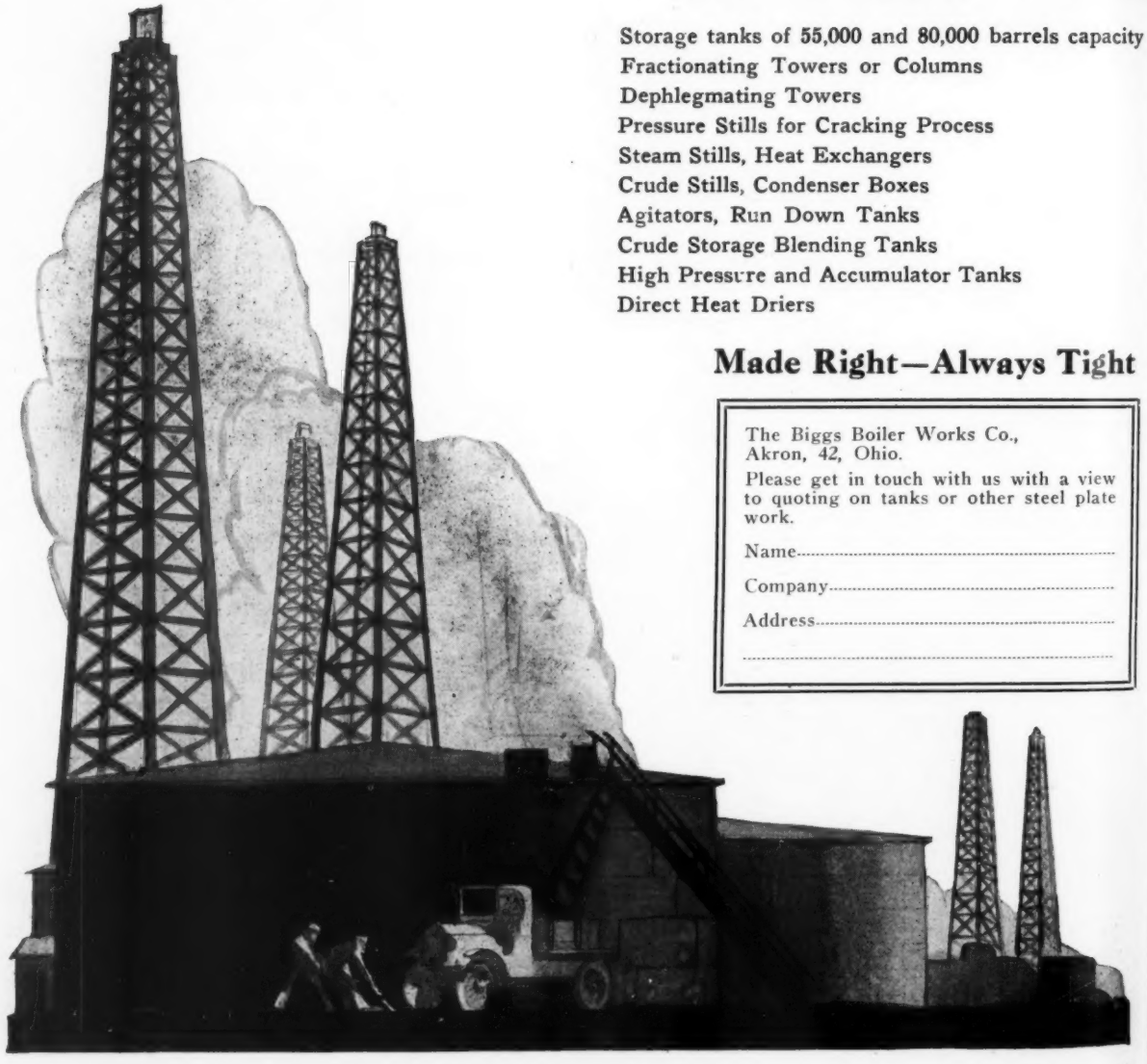

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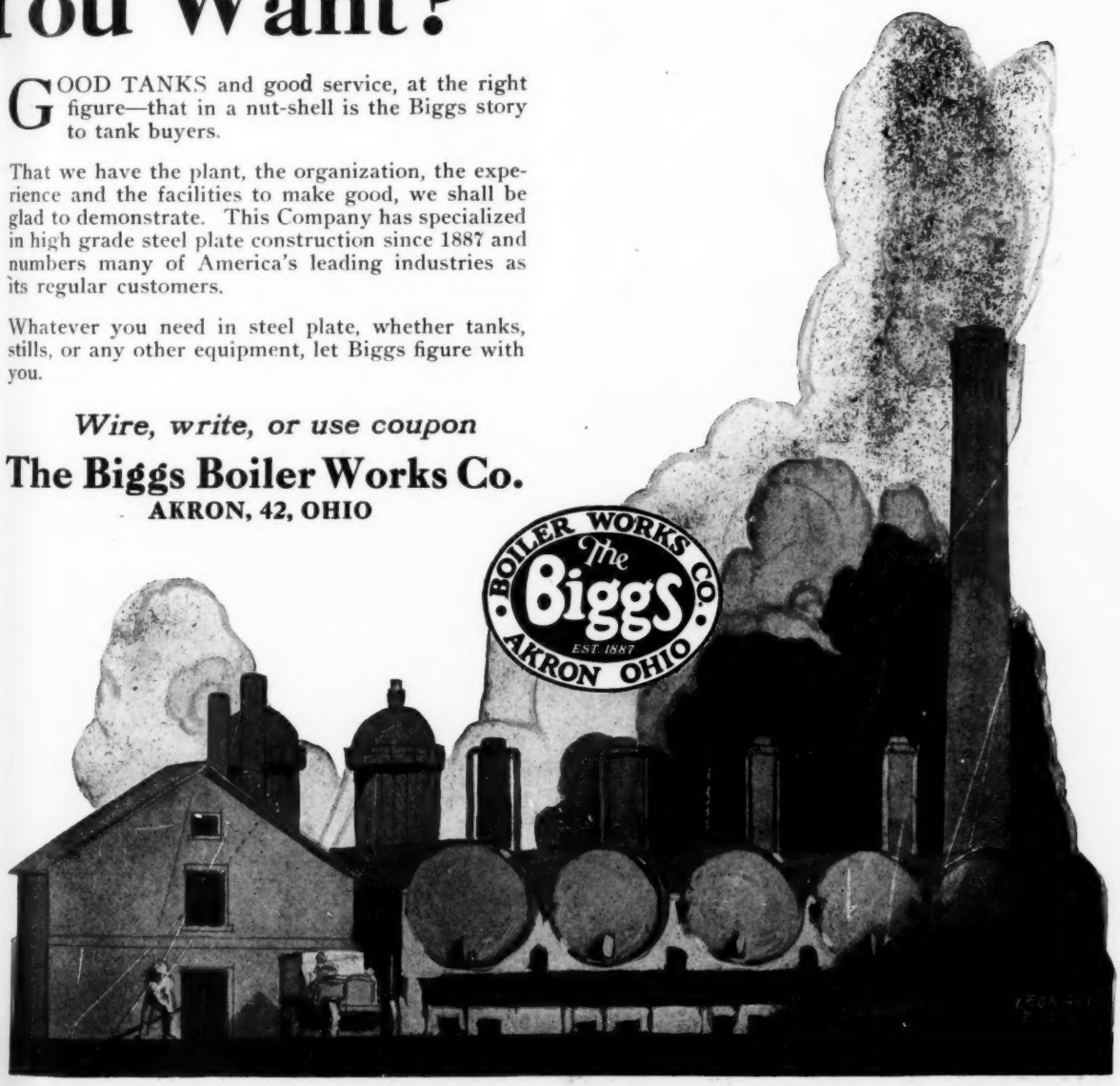

Tell them where you saw the ad

sults. Steaming or hot water had been found to be effective for cleaning the bauxite after use, and in practice it has been found advisable to make additions of fresh bauxite from time to time during the operations in order to maintain the efficiency. The action was described as a surface adsorption action and the natural color of the oil was almost eliminated.

The research department of the Anglo-Persian Oil Company had devised an instrument to which the name of the Ergometer has been given, the object of it being to enable determinations of the adsorptive efficiency of the particular bauxite to be determined. It had been found that the bauxite from various parts of the world differed as regards its efficiency, and, at any rate, as far as the Anglo-Persian oils are concerned, the bauxite obtained from India has been found to be the best. Mr. O'Brien, one of the authors, had been associated with this work of the Anglo-Persian Company since it began, and expressed the opinion that bauxite promised to bring about remarkable changes in methods of refining as far as the Anglo-Persian oils are concerned. In one case 80 per cent of the sulphur content of the oil was removed at one filtration, but it was admitted, in answer to some points raised in the discussion, that those who had been engaged on this work were not yet able to state with certainty what was the nature of the sulphur compounds that are recovered. It was also stated that there is little or no loss of oil in the process, but this depends upon the method of regeneration of the bauxite. By the use of superheated steam the whole of the adsorbed particles were driven out and recovered, and those not driven out were not worth refining. Emphasis was laid upon the work done by the late Dr. Hood on the use of bauxite as a refining agent, and to the need for studying the particular characteristics of the bauxite used in relation to the type of oil, although the view was expressed that other oils ought also to be susceptible to treatment in this way.

Brown Company Announces Bulletin on Pyrometers

Believing that enough thermo-electric pyrometers are in use to warrant a special publication on their installation and care, the Brown Instrument Company of Philadelphia has recently published a 72-page book covering this subject thoroughly. It is entitled "Instructions for Installation and Care of Thero-Electric Pyrometers." There is hardly a man who works with Pyrometers who does not at some time desire information regarding protecting tubes for Thermocouples, and various methods of wiring indicators and recorders, methods of eliminating cold junction errors, methods of installing couples, and of checking thermocouples, wiring, or the accuracy of the instruments. These subjects are gone into from the practical and theoretical angles, as well as such other subjects as open, and conduit wiring, mounting the instruments, locating defects in the thermo-electric circuit by various means, and many other points which will be of immense interest to the man who has to work with the equipment from day to day. This book also contains temperature Millivolt Equivalents for thermocouples and conversion of Fahrenheit and Centigrade Scales. It is free to users of Pyrometers.

Magnolia Has Explosion In Texas Carbon Plant

Breckenridge, Texas.—An explosion of gas in a packing room of he carbon black plant operated near the city by the Magnolia Petroleum Company on March 15 fatally burned Luther Lingle, 32, and seriously burned Clyde Leverett, another employe working in the room. The two workmen were engaged in sacking the carbon black with a machine when the explosion occurred causing the walls of the building to be blown off and setting fire to the stock of carbon black, which burned for several days afterward. It is believed that the explosion was caused by a spark from the machine, when the building became filled with gas escaping from a leaky pipe.

Forrest E. Gilmore is now located in Los Angeles, California, where he is engaged in the construction of gasoline plants. Mr. Gilmore is specializing in a portable gasoline plant which has a number of interesting features.

Tank Car Repairs!

With the busy season just ahead, it is sound business to see to it that all cars are in shape to give maximum service. Small repair jobs attended to now may prevent much more costly ones later.

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Three convenient, fully equipped shops;

Workmen thoroughly trained in the work assigned to them;

Experience gained in repairing, overhauling and modernizing thousands of cars for companies large and small, all over the country.

You assure yourself of a first-class job at reasonable cost when you send your equipment to any of the shops listed below.

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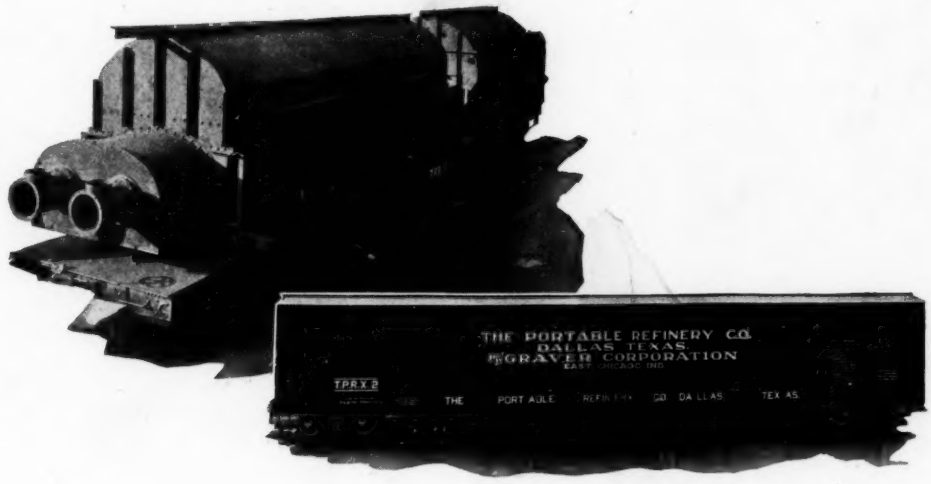
EVERYTHING IN STEEL PLATE CONSTRUCTION FOR THE OIL INDUSTRY



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The Portable Refinery, a complete refinery mounted on two flat cars, was built complete in GRAVER shops. The Sinclair Refinery at East Chicago, Indiana, covering many acres, was built by GRAVER men.

The smallest refinery and one of the largest—both are the products of the same engineers, the same shops and the same organization.

Works such as these show the organization, ability and equipment of the builder. What the customer wants is being built and built right by GRAVER.

Behind each piece of GRAVER-Built equipment stand the four sons of the founder of the company. They are actively in charge of every phase of the business. Their reputation was gained only by having the customer satisfied.

When you need anything in steel plate, you can safely trust it with the engineering, men and machinery of GRAVER Corporation. **Write for quotation on your requirements.**

When welded equipment is required, the GRAVER R I O W Construction—Riveted; Inside and Outside Weld—will prove the best.

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Rushing Natural Gasoline to Our Customers by Train Load

"Ship at once train load of natural gasoline"—more than once a big customer has set us such a wire.

And the train is thundering on its way within a few hours —every car containing the exact specifications wanted.

This is the service this company can give its patrons. Any reasonable amount of natural gasoline shipped at once in guaranteed specifications.

Chestnut & Smith Corporation

General Offices

Chestnut & Smith Building, Tulsa, Oklahoma

Tell them where you saw the ad

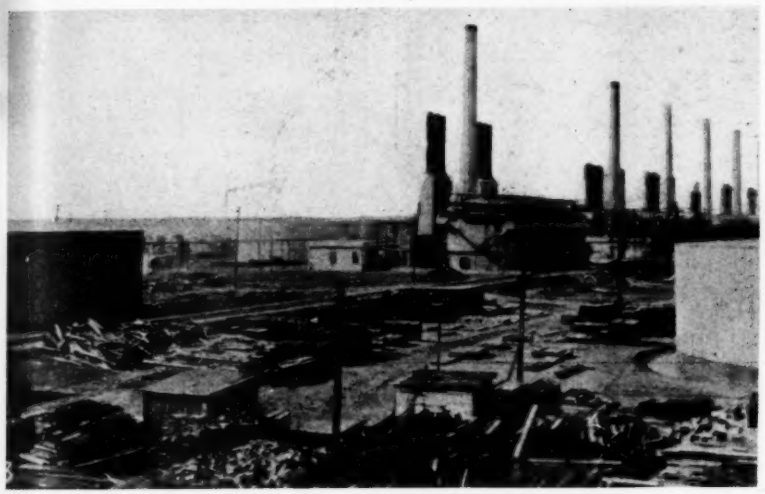
Salvage Lumber Yard Means Big Saving

Whiting Refinery recovers thousands of dollars from odds and ends thrown away

By G. J. Prentice
Foreman of Clean-up Dept. and Lumber Salvage yard Standard Oil Co.*

FOUR years ago, one could, upon walking through the Whiting refinery, find a large amount of lumber scattered around tanks, fields, along roads, and at the ends of still batteries. Oil soaked lumber, split planks and damaged lumber greeted the eye.

The idea of a salvage lumber yard was conceived by the Safety department. This department immediately conferred with the management in regards to its establishment. An appropriation was granted for the purchasing of a saw and a site selected for storing and reclaiming this lumber.



The lumber yard where the Standard Oil Company of Indiana is salvaging scraps from its refinery.

Previous to the establishment of the Salvage Lumber Yard, a great deal of this material was distributed around the various tower stills to be burned up, while some of it found its way to the scrap wood pile where it was sold as scrap wood.

Actual work of reclaiming this lumber began upon the arrival of the saw, April 1, 1921. The cost of this saw installed was $874.47. The saw is a portable one and can be made into a rip or crosscut.

There were on hand approximately three carloads of split plank and about the same number of broken, partly burnt and oil soaked plank.

Split planks were sawed or ripped into 2x4-inch and 2x6-inch. 2x12-inch by 12-foot split plank were ripped into 2x4-inch or one 2x6-inch varying from 8 to 12 feet in length. Planks that are partly oil soaked are put through the crosscut saw saving whatever part that is not oil soaked.

Planks partly burned are sawed into short lengths for covering lines, etc. Lumber used as bracing inside of tanks, formerly thrown away, is saved and being used as sills, etc., on temporary sheds or similar construction. What wood is left is sold to employees as scrap wood. Even the sawdust is saved and some departments, either by men or wagon call for this material. It is used for cleaning up oil on iron walks and cleaning out tanks. Hardwood brought into the plant with shipments of material is cut into various lengths and used by the switching department for blocking.

The Salvage Lumber Yard is a storage yard for blocking, forms and horses. Blocking is piled according to its various lengths in neat piles. This is a time saver for a truck can be sent direct to the Salvage Lumber Yard and get just what is needed without any delay.

In order to get this material to the saw the Salvage Lumber Yard co-operates with the clean-up department, whose gangs when cleaning around the plant, pick up all this material that is scattered about and pile it along the roads. Its location is then reported to the foreman who has the pick-up team haul it to the Salvage Lumber Yard. At times, carloads of this material are sent to the yard upon the completion of construction work.

On the arrival of this lumber, it is first cleaned, nails pulled, or whatever is necessary to be done for the saw to receive it. All planks that are split are put in one pile and planks that are broken are placed in another.

There is on hand at present 126,614 feet of lumber ready for use—approximately 186,000 feet of split and broken lumber, 6,000 feet of hardwood blocking, 70,000 feet of blocking for storage, thirty-five various ladders, boilermaker and bricklayer horses, doors, pump bases and skids, gin poles and concrete chutes.

About 324,765 feet of salvaged lumber were used on various repair and appropriation work during the year of 1922, and 381,698 feet were used during the past year, 1923, 179,990 feet of blocking has been used and brought back for storage during the past two years.

The total cost of reclaiming this material is approximately $10 per thousand. In most cases when used, it replaces new lumber which would cost $50 or more per thousand.

If new lumber had been supplied where all of the salvaged lumber was used last year, it would have cost approximately $19,075. The entire cost of salvaging, however, was $3,815, which gives a saving of $15,260 in 1923.

*Reprinted from the Standolind Record.

Effects of Applying Vacuum to Gas Flow

(Continued from page 14)

part of which may be traced to this phenomena of pressure reduction. Since vaporization out of solution and out of liquifaction is proportional to pressure, if such a well has such volume of oil and gas flow, coupled with size of casing, that the entrained gas exerts buoyancy and frictional contact as well as impact with the oil sufficient to lift the pressure of the entire column of oil off the sand, the gasoline content of the gas is naturally greater than the gas from a well in which gas is maintained under pressure due to incomplete lifting of the column of oil by the gas, maintaining pressure upon the sand, which prevents evolution of gas lower in the series. And, oil from the first well will have a lower initial boiling point than oil from the second well, both wells in the sand near one another.

Why Large Variation

The writer believes that he has definitely established the foregoing while attempting to find the reason for widely varying gasoline content of gas from adjacent wells in the same sand.

Pressure does vary we know. An analogy may be had in the air lift for blowing wells. When the oil level stands at the same level in two wells of the same depth, both will start against the same air pressure but one will invariably run at a different pressure from the other, due to quantity of oil and gas produced. If the quantity of oil produced from one well is such that the proportions of oil, air and eduction pipes, and gas is about correct, while the other is not, the latter will run under a higher or lower pressure, depending upon the oil produced. Excepting liquifiable fractions, the point is the same in the two cases.

In testing casinghead gas for gasoline content, there is some explanation

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STEEL CASTINGS FOR REFINERIES

Open Hearth Process
Quick Delivery—Made in Houston
From One Pound to 8000 Pounds
Analysis of Every Heat Controlled in Our Own Laboratories, Insuring Uniform Quality.
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STEEL

FULTON LOW PRESSURE REGULATOR AND AUTOMATIC CUT-OFF—6-INCH INLET, 8-INCH OUTLET

Made to reduce the service main pressure to a few ounces, or as low as may be convenient for safe and economical combustion. By changing the position of the weight on the lever, the pressure may be reduced to anywhere from two ounces to one pound.

Our regulator makes a perfectly tight joint, is perfectly balanced and WILL NOT STICK.

Chaplin-Fulton Mfg. Co.

28-36 Penn Ave., Pittsburgh, Pa.

of the wide variation between adjacent wells, and the foregoing, I believe, explains a part of the variation.

As the pressure of gas forces oil and gas to the well bore, then lifts oil out of the well by pressure, buoyancy of gas, frictional contact and impact of gas bubbles with oil, it follows that velocity in the sand is proportional also.

Every sand, loose sand or sand rock, is composed of large and small grains, silt or cementitious material as shown by microphotographs in an article by the writer published in The OIL WEEKLY of October 27, 1923. As shown by the article referred to, the small particles have a tendency to migrate through the interstices of the larger particles. Consequently, to open a sand up by removing such fine particles, a well would be allowed to flow at capacity after first bringing in, until oil so produced shows no fine sand or silt whatever, when the sand may then be said to be opened up. Producers of long experience aver that the first well opens up passages to such well, allowing a free flow to such first well of the field, and that an offset well, drilled in later, has not as much initial or settled production due to this cause. The writer has found this to be true and, if means were taken to open the pore spaces around every well and keep them open, greater total recovery would result.

Since gas is perfectly elastic, a reduction of pressure caused by opening the sand to the atmosphere through the well bore, naturally causes a rush of gas through the sand to the well. Further reduction of pressure, in a pumping well, causes a rise in this velocity, due to the large volume of the same quantity of gas. The writer has found that this increase in velocity causes further sand particles to migrate to the well, and we know that cleaning the sand assists production immediately and ultimately, so that this standpoint, although vacua may pull in sand, such sand should be pulled in and gotten out of the way so that further oil may flow into the well more easily.

Since gas, expanding but doing no work, would cause no reduction in temperature in the sand, but sand temperatures do reduce, the gas evolved evidently does work, through, a priori, we cannot prove it except by analogy. Gas forces oil to the well bore against pressure and friction of oil and the gas itself against the surfaces of the sand grains; thereby doing work, resulting in lowering temperature of the oil in the sand and of the sand body itself.

Since the volume of gas varies directly as the pressure, when pressure is reduced, velocity increases causing higher velocity through the sand. The volume of one pound of air, (gas) at 14.7 pounds absolute, or atmospheric pressure at sea level is 26.79 cubic feet; at 10 pounds absolute, or 9.56 inches of vacuum, the volume increases to 38.38 cubic feet and at 5 pounds absolute, or 19.74 inches vacuum, volume increases to 73.33 cubic feet, while at 1 pound absolute, or 27.88 inches vacuum, the volume is 333 cubic feet. A curve showing the pressure-volume relation graphically is printed herewith, indicating that velocity increases enor-

mously when vacuum approaches absolute zero of pressure.

The flow of fluids, liquid or gas, according to the laws of friction are:

Independent of pressure between the fluids in contact;

Directly proportional to the surface areas in contact;

Proportional to the density of the fluid;

Dependent upon viscosity, although this relation is not definite;

Proportional to the square of the relative velocity at medium to high speeds, and to the velocity at low speeds.

Vacuum is applied only to pumping wells, however, and where the sand has become partially denuded of oil, or partially saturated due to withdrawal, high velocity carries oil to the well bore by impact and by frictional contact.

As before, when vacuum is applied to a well suddenly, sand, fine particles, will migrate to the well and it may sand up, resulting temporarily in a loss of production, but affording more oil eventually. The well may cave, allowing some of the sand body to fall into the well. This may also result in a temporary loss of production, but, since a new sand face is exposed, production should not show a net loss in this case either.

In fields producing oil of very low initial boiling point, a reduction of pressure releases fractions from solution as outlined before. Before the advent of vapor proof tanks, these fractions were largely lost, unless the gasoline plant took them beforehand through gathering lines. Many plants connect gathering lines to the tanks, as well as the well, to take in these gas fractions from the tanks.

Fields producing high gravity, low boiling point initially, show that gravity has been reduced and the boiling point raised, due in part to extraction of some of the lighter fractions by vacuum. This is of benefit to the producer in the additional yield of gasoline and of detriment in the reduction of gravity. Just what proportion of gravity reduction is due to vacuum is problematical, however. Early production in a field is from the top, top oil, naturally, and later production from the bottom part of the sand. The lower part of a sand seems to produce oil with a higher tar and paraffin content than the upper, and gravity would therefore be somewhat lower due to this cause. But, at the same time, a lowering of the boiling point indicates that a part of the reduction is due to releasing some of the lighter fractions.

When a sand pore is evacuated of oil, something must occupy the same pore space. If gas from another place fills this pore space, displacing the oil, and allowing the oil to travel toward the well bore, that much more oil is recovered. If the oil within a pore space gives up enough gas itself to fill the pore space, then the oil may migrate to the well bore. A reduction of pressure releases gas, consequently, vacuum, applied to the sand produces gas to fill the pores and assist in production in this manner.

The quantity of gas so produced exceeds the volume necessary to fill the pore space, especially under high vacua and the excess gas goes to the gasoline plant.

The gasoline content of casinghead gas increases not so much with the age of the field as with the two factors:

Evacuation of the sand, exposing more oil surface and oil covered sand surface within the pores to the effect of reduced pressure;

A great reduction in pressure.

Fields gradually evacuated under low vacuum show a gradual increase in gasoline content of gas, while fields rapidly evacuated of oil by intensive drilling, and placed under high vacuum, show a very much larger increase of gasoline content.

The Burkburnett Northwest Extension is credited with gasoline yields, compression plant, of as much as 20 gallons per thousand feet with vacuum of 24 to 25 inches; while an adjoining field, several years older, is credited with 6 gallons per thousand, produced by gradual evacuation and low vacuum.

The writer believes that this situation proves that vacuum carried high vaporizes out of solution progressively higher boiling fractions, since oil from the high vacuum field has a higher boiling point, and a greater rise in boiling point, than oil from the low vacuum field, although the boiling point of both oils was almost the same during initial production.

An old well in a non-vacuum field, producing no gas naturally, increases gas production under vacuum further supporting the above. Of course, some of the gas may have been held within the pore spaces and then released by pressure reduction and volume increase, but the quantities secured continuously, after applying

Will the Buyers at this Great Gathering See Your Goods ?

The World's Oil and Gas Show

The 1923 show made history. Thousands of the foremost men of the oil and gas industry attended. Millions of dollars worth of goods were bought. The crowds that packed last year's limited space will be here this year, along with thousands of others.

THE SALESROOM OF THE PETROLEUM INDUSTRY

Here the buyers of the world's second largest industry will again assemble. Larger grounds and improved facilities permit ideal arrangements and will give visitors better opportunities to inspect and buy.

Will your goods be shown here? Wire or phone, a letter may be too slow.

INTERNATIONAL PETROLEUM EXPOSITION

E. F. Mc'ntyre, General Manager

TULSA, OCTOBER 2-11

vacuum, coupled with an increase in boiling point of the oil, still bears this point out.

Oil, held within a pore space by capillarity, beyond question is forced out of the pore space when pressure is reduced and gas is so evolved because the gas will rise to the top of the pore space, or to a cover in another pore space and force the oil out in the direction of reduced pressure which is toward the well bore. These are minute, to be sure, but all oil is divided and held in minute spaces and a study of the situation must be necessarily of conditions as found.

Oil held in sand by adhesion also may be forced toward the reduced pressure area, the well bore, by gas velocity, as may be shown experimentally by blowing gas through sand. And because this depends upon frictional contact of gas with the oil, and friction increases as the square of velocity, gas rarefied by pressure reduction exerts a greater force upon the oil toward the lower pressure area—the well bore. Density of gas, lower density, reduces friction, however. In steam turbine work, it has been shown that wheels revolving under pressure require more power than wheels revolving under vacuum, so that, in wells, the maximum realization of this is with gas of the most density.

Sands of small pore space—sandy lime fields—give up gas more slowly than more open sands and a general reduction of rock pressure is slower, so that the effect of vacuum is not as quickly secured in sandy lime or tight sands.

The yield of gasoline then, from a tight sand does not increase as rapidly as the yield from an open sand field, both producing oil of the same general characteristics.

As a general statement, vacuum should assist in a greater ultimate oil recovery in tight sands than loose sands, since the tight or low pore space sands, with smaller capillaries, tend to retain oil more than sands with larger pore spaces.

In fields with bottom water, the producer may fear that vacuum increases water and lowers production thereby.

In thin sands, three or four feet thick, this may be true to some extent, when vacuum is not properly applied, but not to the extent that is usually imagined. Pressures below atmosphere are so small compared to pressures above atmosphere that the movement of water upward is not due to vacuum as much as to pressure of the water itself.

When vacuum of 20 inches is applied to the mouth of wells, there is a reduction of vacuum, of course, at the bottom of the well, depending upon the friction of gas up the casing and leaks, so that four or five inches less may be recorded at the bottom. Sixteen inches of vacuum equals about 8 pounds pressure so that water below is under 8 pounds less pressure. Considered as a whole, this pressure is negligible when considered with reference to water.

Evacuation of oil may cause trapping of oil between wells by "coning" water around the well which occurs whether vacuum is applied or not.

It is generally thought in the field that because high vacua is so difficult to secure and maintain and because it has such great effect upon gas, that its pressure relation and effect is greater than it really is.

When vacuum is applied gradually to a whole field, pressures over the whole sand will equalize in time and water trouble is not magnified under such conditions.

The general rule of conservation authorities is that vacuum can be applied only to partially depleted fields. Just what a partially depleted field is has not been defined, consequently no general rule has been adopted as to the time that vacuum may be applied and the amount.

It is certain that vacuum increases immediate and ultimate production; a maximum realization calls for a careful study of the field from the date of the discovery well, when the necessity for vacuum becomes apparent at a definite time in any field when a vacuum in the proper initial amount should be prescribed for the entire field, maintained uniformly, increased properly and uniformly at the proper time, as disclosed by field conditions.

As practiced, however, vacuum is carried by one producer as high as he can get it, when his neighbor raises his, and then the performance is repeated, perhaps by installing more equipment, resulting in vacuum unnecessary in the light of conservation; vacuum very expensive to secure and maintain, since the volume of gas increases materially with vacuum and plants installing equipment for high vacuum eventually

(Continued on page 48)

Equipment for your Acid Plant

from

Acid Proof Chemical Stoneware

Figure 167
Standard 50-Gallon Woulff Jug or Receiver

Single Pieces or Complete Plant Fquipment in Chemical Stoneware

Our ware is GUARANTEED acid resisting and corrosion proof, is positively non-absorbent and non-contaminating. Further, we GUARANTEE it to be free from defects and must please you in every respect.

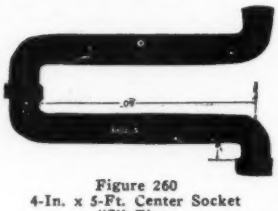

Figure 260
4-In. x 5-Ft. Center Socket "S" Pipes

We do not depend upon a glaze for the above named qualities of our ware.

"It is in the Body Itself"

No order too large or too small to receive our very best attention and service.

Let us know your requirements.

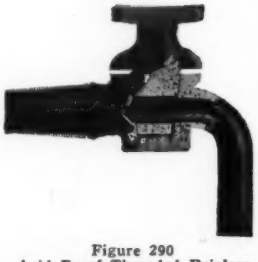

Figure 290
Acid Proof Threaded Dripless Faucet

Figure 181
Acid Proof Nitrating Kettle With Cover

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NEW EQUIPMENT, CATALOGS, BULLETINS, BOOKS

New Fire Fighting Device Is Offered to Refiners

A FIRE fighting device claimed to have unusual possibilities for putting out still fires, is being put on the market by the Texas Sprinkler Company, 1411 Preston Avenue, Houston, Texas.

The outfit consists of a standard sprinkler system to be installed about the battery of stills and a steel storage tank which is connected to the sprinkler system by a gas line. The equipment can be manufactured for any size battery. For a 5-still refinery, the storage tank is of 500 gallons capacity; for a 10-still size, the tank holds 1,000 gallons.

Spray heads are located at every position where there is the probability of a fire breaking out.

Uses Chemicals and Steam

The storage tank holds a combination of chemicals which when mixed with water form a gas. This gas is held in the system under air compressed to 300 pounds. When a fire breaks out, it melts off the nearest spray head and instantaneously the gas is released at that point and blows against the fire at a pressure of 300 pounds. As the pressure in the line is lowered, a steam valve automatically opens and steam from the boilers is blown on the fire through the sprinkler system at a pressure of about 100 pounds. Thus the smothering power of the gas is quickly supplemented by steam.

The spray heads are held in position by a metal which melts at a very low temperature and will melt off readily, releasing the gas.

Rings Bell

An electric short-circuiting device rings a bell the minute the fire breaks out, warning operators that a still head is blown.

Chemicals for generating the gas cost very little and according to the manufacturers of the system, the total cost of renewing these chemicals does not exceed $5.00.

The outfit has been thoroughly tested, according to its manufacturers.

Charcoal Process of Gas Extraction Explained

Full detail of the charcoal process of gasoline recovery are given in a booklet being distributed by the Gasoline Recovery Corporation, 62 Cedar Street, New York City, New York.

According to the manufacturers of the process, this method of gasoline recovery has established itself as an efficient method for use in recovering gasoline from gases containing gasoline vapors. At the present time there is a production from charcoal absorption plants of 10,000,000 gallons yearly, and the process has been in use only about two years.

The process is explained in minute detail and an abundance of illustrations are used to make clear how the system works. A number of pictures are used to show plants that are now extracting gasoline by the charcoal process. Copies of the booklet are for free distribution and can be secured upon application to the company.

Bulletin Describes Oil Vapor Purifier in Detail

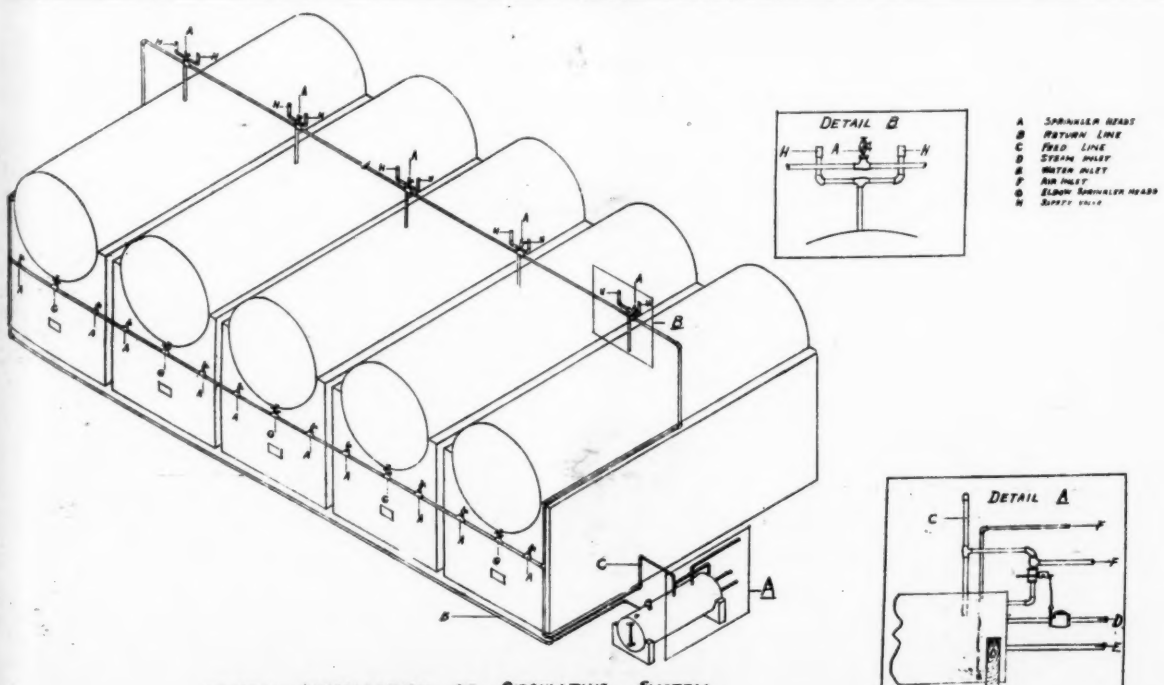
The Tracy Oil Vapor Purifier is described in Bulletin No. 27, published by the Andrews-Bradshaw Company, 530 Fourth Avenue, Pittsburgh, Pennsylvania.

The purifier is designed and installed to completely remove all liquid particles from vapors, prior to their leaving the distillation units. As explained in the bulletin, the basic design of the purifier is essentially that of a low velocity multiple baffle separator.

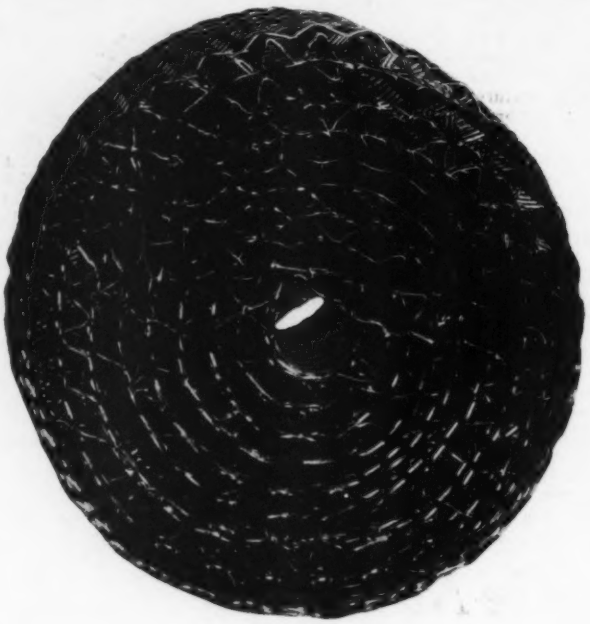
Cuts and illustrations used in the bulletin can be secured by writing the company.

Bulletin Describes Casing

Standard Seamless Casing is said to have five distinct advantages over ordinary casing. These are described in a bulletin on seamless casing, issued by the Standard Seamless Tube Company, Pittsburgh, Pennsylvania. Copies of the bulletin may be secured by writing the company.



TYPICAL INSTALLATION OF CIRCULATING SYSTEM AS APPLIED TO A BATTERY OF FIVE STILLS DESIGNED AND ERECTED BY J.B. COLLINS - ENGR. HOUSTON, TEX. 5/9/24



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A NEW

FOSTER BAFFLE

FOR ABSORPTION GASOLINE PLANTS

Retaining the efficiency and positive action of the corrugated sheet baffle, but fabricated from metal lath to meet the demand for a baffle porous in all directions.

DEAN E. FOSTER & COMPANY

Consulting-Manufacturing and Operating Engineers

Specializing in Natural Gasoline Plants

WRIGHT BUILDING

TULSA, OKLAHOMA

Borden Company Issues Booklet

Beaver pipe cutters are featured in a new pamphlet being distributed by the Borden Company.

New features of Beaver Pipe Cutters are brought out in the pamphlet, showing several improvements in the cutter. Copies of the pamphlet can be secured from The Borden Company, Warren, Ohio.

Dart Booklet Announced

A booklet dedicated "to the man who knows what a leaky union or flange is; how it wastes time, spoils good work, tries the temper, and costs in labor and money," is announced by the E. M. Dart Manufacturing Company, Thurbers Avenue, Eddy and Blundell Streets, Providence, Rhode Island. Copies can be secured for the asking.

New Calco Handbook of Recuperation Now Out

The Calco Handbook of Recuperation is a book, a few copies of which are for gratuitous distribution among important executives in plants which operate oil, gas or coal fired industrial furnaces.

The book is loose-leaf and contains data, tables, charts, drawing and photographs not published before.

There are 13 sections in the book, each devoted to some phase of heat recuperation.

As a sample of what the different sections contain, the following list covers contents of section No. 1; 70 per cent fuel waste, 30 per cent utilized; average industrial furnace efficiency; startling reversal of these figures possible; how one large forge shop saved $4,000 a month in fuel alone by applying the principles of recuperation; the reason for recuperation; charts of heat losses at various furnace temperatures.

Copies of this book will be mailed to executives upon request to the Calorizing Company, Pittsburgh, Pennsylvania.

GRAVER HAS NEW BOOKLET

An eight page booklet describing the Graver Intermittent Water Softener has recently been published by the Graver Corporation, East Chicago, Indiana.

The softener consists of two wooden tanks and a gravity filter. No motor is necessary for its operation. Treated water is used from one tank while that in the other is settling. The softener is designed for raw water ice plants of 10 tons or less capacity and for the smaller boiler plants.

Copies will be mailed on request to all interested. Ask for bulletin 505-I.

Another Gasoline Plant Planned by Texas Pacific

Fort Worth, Texas.—The Texas Pacific Coal and Oil Company of this city is reported to be contemplating the erection of a natural gasoline plant in the Caddo section of Stephens County within a few months. Tentative plans call for the use of the absorption process in the plant, which will have a daily capacity of between six and eight million cubic feet.

Goulds Bulletin on Pumps

Pumps for the oil industry are featured in a folder recently issued by The Goulds Manufacturing Company, Seneca Falls, New York.

This folder shows a complete line of Gould pumps for Natural Gasoline Plants, including single stage double suction type, multi-stage type, single-acting triplex pressure pumps, single-acting triplex type, double-acting single cylinder type, single-acting triplex plunger type, and double-acting triplex piston type.

Copies of the folder may be secured by writing the company.

Big Saving Effected by Graver Hot Process

Chicago, Illinois, June 4.—Graver Corporation, East Chicago, Indiana, has issued in booklet form the report of an investigation made by the A. C. Nielsen Company, of the Graver Hot Process Softener in use by the Skelly Oil Company, Eldorado, Kansas.

This report shows that the Hot Process Softener installed by this concern is saving them annually $4878 in coal and labor, an annual return of over 100 per cent on the investment. A tabulated cost and saving statement is included.

This information will be valuable to everyone operating a steam power plant. Copies may be had by writing the Graver Corporation, asking for survey No. 16.

Bulletin on Hot Oil

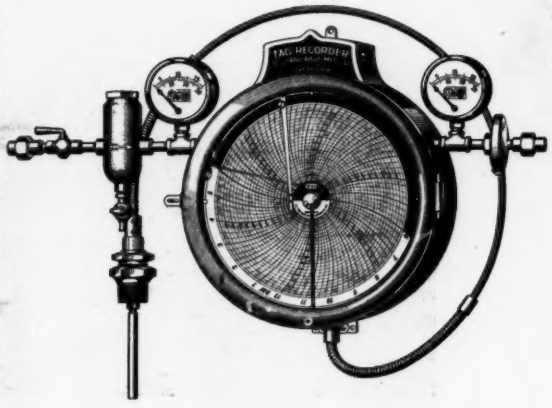
Wilson-Snyder Manufacturing Company is announcing for free distribution, a bulletin describing a Direct Acting Duplex Steam Pump for handling hot oil at 800 degrees Fahrenheit against high pressure. The company has placed 64 of these pumps that are now in operation. The bulletin may be had by writing Wilson-Snyder Manufacturing Company, Pittsburgh, Pennsylvania.

Pamphlet on Coating Process

"Originally conceived as a means of coating iron and steel with lead to provide protection against atmospheric corrosion, the Schoop Metal Coating Process has been developed and perfected so that now any of the commercial metals, either in wire or dust form, may be readily applied to nearly all kinds of materials." The above is quoted from a pamphlet recently issued by the Metals Coating Company of America, 495-497 N. Third Street, Philadelphia, Pennsylvania. Copies will be mailed upon request.

Many Distinctive Points In New Tagliabue Meter

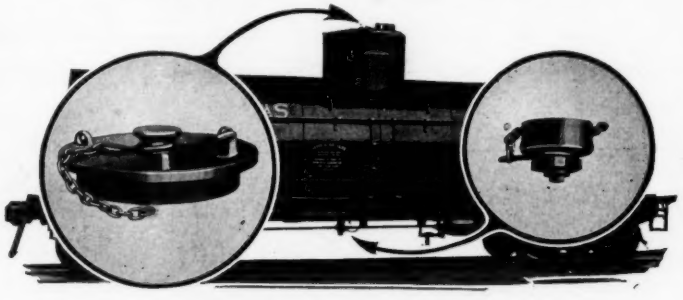
The C. J. Taglabue Mfg. Co., Brooklyn, N. Y., has added to its instrument line, a combined Recorder-Controller. In this design an air-operated temperature controller mechanism and a recording thermometer are mounted in the same case and are actuated by the same thermostatic system. All the structural features of the TAG Recorder such as the uniformly graduated chart, noncorrodible inverted fountain pen, pen pressure and position adjustment, improved chart holder are incorporated in this design. An important improvement is the entire elimination of the rubber connections usually employed in instruments of the conbined form.



Which is Stronger?

The Name or the Steel?

Any manufacturer can make steel or cast iron. Just as anyone can go into the refinery business. But it takes a real organization and a rigid standard of quality to develop a name with the prestige of Western Iron and Foundry Co.



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Orders by wire or letter taken care of immediately

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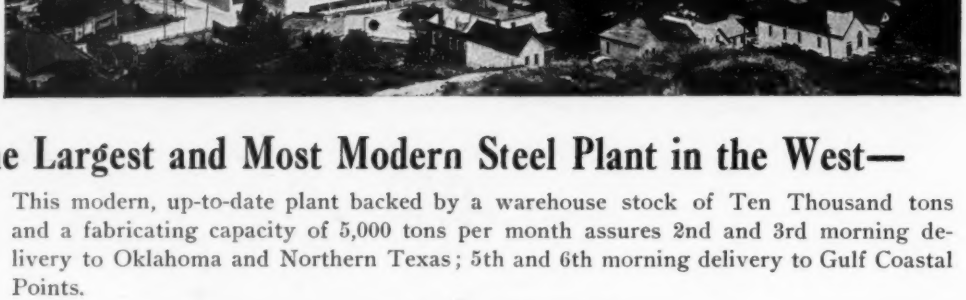

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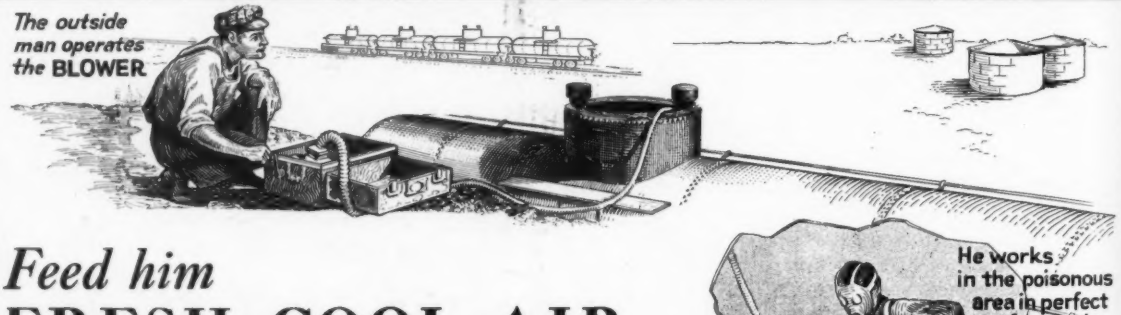
This modern, up-to-date plant backed by a warehouse stock of Ten Thousand tons and a fabricating capacity of 5,000 tons per month assures 2nd and 3rd morning delivery to Oklahoma and Northern Texas; 5th and 6th morning delivery to Gulf Coastal Points.

Kansas City Structural Steel Company

KANSAS CITY, U. S. A.

Tulsa, Okla. Dallas, Texas Denver, Colo.



Feed him

FRESH-COOL-AIR

—and he'll work with greater ease, comfort and safety.

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HOSE MASK

Supplies a continuous stream of fresh air to workers in Tank Cars, Oil Tanks, or in any confined gaseous space.

Send for Bulletin No. 99F for complete information on this and other types of Hose Masks

Mine Safety Appliances Co.

Chamber of Commerce Bldg. Pittsburgh, Pa.

Standard for the American Gas Association

Tell them where you saw the ad

RECENT REFINERY PATENTS ISSUED

BY STAFF REPRESENTATIVE

Washington, D. C.—The following patents on machinery and equipment of interest to refiners were issued by the United States Patent Office during the month of May:

No. 1,492,963, issued May 6 to Rudolph Conrader, Erie, Pa., on an apparatus for treating oil, in which is the combination of a separating tank; means for delivering and discharging oil to and from the tank; means for taking out the accumulated gas and producing a vacuum in the tank; devices automatically controlling the delivery and discharge of oil comprising valves controlling the delivery and discharge of oil to and from the tank; a lever for each valve; oppositely arranged slots in the levers; and a valve stem having a head operating in said slots to move each lever in one direction and in a direction opposite to that of the other lever to control the valves.

No. 1,493,880, issued May 13, to James B. Jenson, Salt Lake City, Utah, on an oil shale retort comprising a vertical cast iron shell having outwordly projecting flanges and surrounded with a heat chamber; a vertical column made up of a plurality of spaced apart inverted frusto-conical rings concentrically mounted within and spaced from said shell; a downwardly tapering egress column made up of a plurality of spaced apart frusto-conically shaped rings; a base ring having an annular recess therein with ports leading therefrom without said first mentioned column and with the interior of said base ring opening to the interior of said column; and axial portion of said ring opening to the interior of said egress column by means of which gas may be withdrawn from said egress column.

No. 1,494,125, issued May 13, to Carl M. Page, Geneva, Ill., assignor to George Fabyan, Geneva, Ill., for an electrically-heated oil-cracking apparatus, consisting of an oil still, a main heater therefor, supplemental heaters supported in the vapor space of the still and each including a pair of concentric cylinders, an electrical heating device within the inner cylinder, and means for locating the heat from said device near the middle of the passage between said two cylinders.

No. 1,494,191, issued May 13 to Horace B. Stezlee, Coffeeville, Kans., assignor to the National Refining Co., Cleveland, for a process of treating petroleum derivatives, which consists in introducing the same to a sealed retort, establishing and maintaining therein a temperature and pressure for cracking a gasoline content therefrom, and meantime subjecting the interior of the retort to the action of an abrading and agitating moveable member, whereby carbon is separated and maintained in a suspended state and the reaction furthered, substantially as set forth.

The General American Tank Car Corporation has announced the entry of an order for two hundred insulated tank cars for the Phillips Petroleum Company.

Bowie-Gavin Cracking Process in California

San Francisco, Calif.—Much interest continues to be manifested in the possibilities of the adoption of the Bowie-Gavin cracking process, developed by Interior Department engineers at the San Francisco office of the Bureau of Mines, to the simultaneous recovery and cracking of oil from oil-soaked sands and shales.

A number of people having interests in the oil-soaked sand deposits of California or Canada have called on the San Francisco office to look the plant over and discuss its operation. Should the flush production in California and elsewhere decline, as many oil operators believe it will, it is apparent that much interest will again be taken in the possibilities of marketing oils that may be extracted from such deposits.

A report on the revitalization of inert material from the Bowie-Gavin process is being prepared by J. S. Desmond, chemist, Bureau of Mines.

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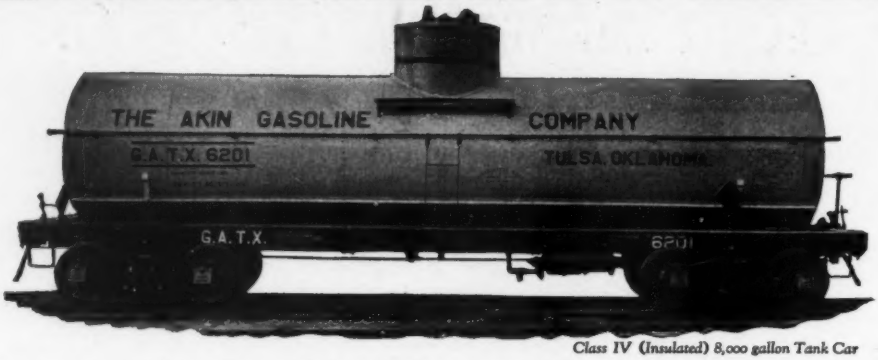

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GENERAL AMERICAN TANK CAR CORPORATION

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The insulated tank car, or class IV tank car, is the outage saver—consequently the money saver, for the transportation of high gravity gasoline. While this car is required for the transportation of inflammable products whose vapor pressure at a temperature of 100° fahrenheit exceeds 10 lbs. per square inch, we also recommend this type of car for other high gravity gasoline whose vapor pressure does not exceed the foregoing amount.

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REFINERY AND GASOLINE PLANT ACTIVITIES

Mid-Continent Runs Increase During May

Efforts to hold down operations meet with 20,000 barrel jump in crude charged

Tulsa, Okla.—An effort to curtail daily runs to refineries in the Mid-Continent area has obviously failed, according to the reports received as of June 1st. An increase of 20,000 barrels per day in these runs over the previous month is indicative of the fact that refineries in the Mid-Continent are side-tracking any adverse criticism and are looking at the optimistic side of things. The reports, which includes the runs of three refineries in Missouri, show that a total of 350,000 barrels of crude are being run to the refineries of this area. With six additional refineries running in the Mid-Continent, the total of running plants is now given as 122 while the number of shut down plants is 118.

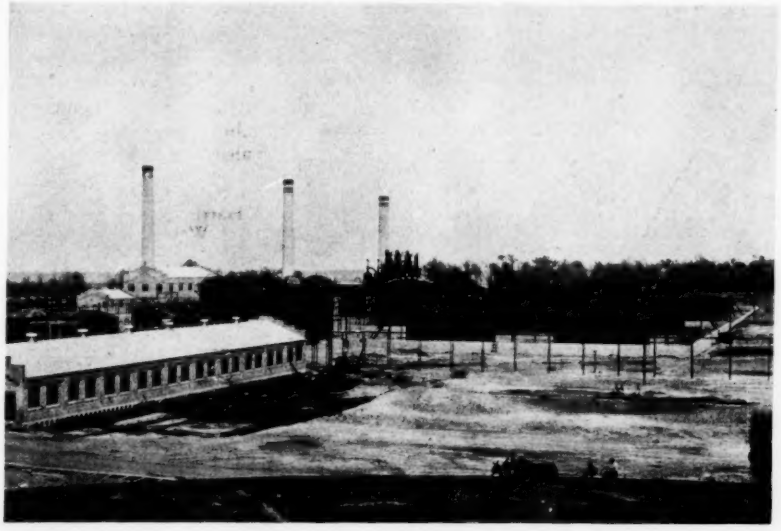
51 Plants Running in Oklahoma

With 51 plants running in the state of Oklahoma, the daily runs to the refineries have reached 149,000 barrels daily, a 9,000 barrel increase over the previous month. Two plants, which have heretofore been shut down have resumed operations, one of which is the Cushing Refining & Gasoline Co., of Cushing, which is running 500 barrels per day on an average.

Reductions in runs in the P. & R. Corporation's refinery at West Tulsa, brings the total down to the thousand barrel mark, as likewise does a decrease in the three plants of the Pure Oil Company. Increase is shown in the runs of the Imperial Refining Company at Ardmore, which is now running 5,000 barrels daily and the Oklahoma-Texas Refining Company at Grandfield, now running an average of 1,250 barrels per day.

Reduce Runs

In Kansas, several plants have reduced their runs. However, the amount now running in this state, totals approximately 70,000 barrels daily. Of this amount, the Skelly Oil Company's refinery at Eldorado is running approximately 9,000 barrels per day while Sinclair is running 12,000 barrels to the two refineries at Argentine and Coffeeville.



Part of the Pure Oil Company's 25,000 barrel daily capacity cracking plant placed in operation early this year at Smiths Bluff, Texas on the Gulf Coast. It is supplied with crude by the company's pipe line from the Mexia and Corsicana-Powell fields in East Central Texas.

Clayton Oil & Refining Company's refinery and cracking units near Dallas, Texas, as seen from an aeroplane.

An increase of six refineries running in North Texas brings the total up 5,000 barrels above the runs of the previous month. The plants which have heretofore been shut down who have resumed running are: Miller Petroleum Co.; Orient Petroleum Co.; both of Wichita Falls; The Noble Oil & Gas Co., of Burkburnett; Iowa Park Producing & Refining Co., of Iowa Park; Clayton Oil & Refining Co., of Dallas and the Boardman Oil Co., of Wichita Falls.

The Rinehart Petroleum Co., are operating the plant of the Bankers Refining Co., at Wichita Falls, and it is understood they are rerunning material from the American Refining Co., which is in close proximity to the Bankers plant.

A four thousand barrels decrease in runs is noted in the total of the Magnolia Petroleum Company runs to

Corsicana plant, which is now running some 5,000 barrels per day.

Only a slight increase is shown in the refinery runs in the state of Arkansis. The total runs of 14,750 barrels daily is approximately the same amount as was running on May 1st this year. The Farmers Oil and Refining Co., of Texarkana and Pine Bluff Refining Co., of Pine Bluff refineries are shut down, while the Hot Springs Oil and Refining Company at Hot Springs is again operating, running about 250 barrels per day.

In Louisiana, an increase of 2,500 barrels per day is recorded in runs. Of this amount of increase, approximately half of the total can be seen in the increase of the Shreveport Producing & Refining Co., plant at Shreveport. The Red River Refining Co., plant at Crichton is the plant reported shut down during the month.

Mid-Continent Refinery Runs by Tabulation

State—	No. of Plants	Capacity	No. Running	No. shut down	Now Running
Oklahoma	103	353,000	51	52	149,000
Kansas	39	117,200	20	19	70,000
North Texas	60	178,200	34	26	75,000
Louisiana	15	48,650	6	9	27,200
Arkansas	18	36,960	8	10	14,750
Missouri	5	17,400	3	2	7,900
Totals	240	752,310	122	118	350,850

Phillips Expansion Makes Strides in Texas Plants

Fort Worth, Texas.—The Phillips Petroleum Company of Bartlesville, Oklahoma has become one of the largest manufacturers of natural gasoline in Texas as result of a recent purchase of four plants being operated in Eastland and Stephens Counties for a consideration amounting to approximately $1,000,000. Three of these plants are located in the Pioneer field, Eastland County, and with their purchase the Phillips Petroleum Company will be without competition from other plants. In Young County, Texas, Phillips has a similar position with four plants in the South Bend and Bunger fields.

To Build New One

Included in the expansion program that has just recently been launched by the Phillips Petroleum Company, is a new plant being erected on the A. P. Shugart lease in the Desdemona-Gorman field, Eastland County. This plant will have a daily capacity of approximately 4,000,000 cubic feet, and will use the absorption process.

Two of the plants just purchased by the Phillips Company were obtained from the National Gasoline Company of Shreveport. One is located on the Walker-Caldwell lease, near Breckenridge, Stephens County, and has a daily capacity of 12,000,000 cubic feet of gas, while the other is in the Pioneer field on the S. D. Nelson lease. The Pioneer plant is capable of handling 15,000,000 cubic feet of gas daily, and has been running about 11,000 gallons a day. It is the largest plant in the field. Shortly after acquiring the National Gasoline Company's properties, the Phillips Petroleum Company purchased the plants being operated in the Pioneer field by the McMan Oil and Gas Company and the Helious Gasoline Company. The combined capacity of these three Pioneer plants amounts to about 31,000,000 cubic feet of gas daily, and the Phillips Petroleum Company has started work on making an equal distribution of the gas production to these plants, connecting the gas gathering systems of all three plants into one unit.

Additional equipment is being installed at the Phillips Petroleum Company's absorption plant in the South Bend field, Young County, to accomodate new gas production recently made available, and the company is also erecting a water reservoir to impound water for its Young County plants.

Watchorn Company Starts Work on Gasoline Plant

Tulsa, Okla.—The Watchorn Oil & Gas Company of Oklahoma City have started work on their natural gasoline plant near Morrison, Oklahoma. The engine and compressor equipment was purchased from Clark Bros. Company of Olean, New York, through the Gas Engineering and Construction Company, sales agents.

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SOUTHWESTERN EQUIPMENT is built in standard units of small cross sectional area. Tube equipment consists of short lengths of high conductivity tubes of special alloy to resist corrosive action and pitting.

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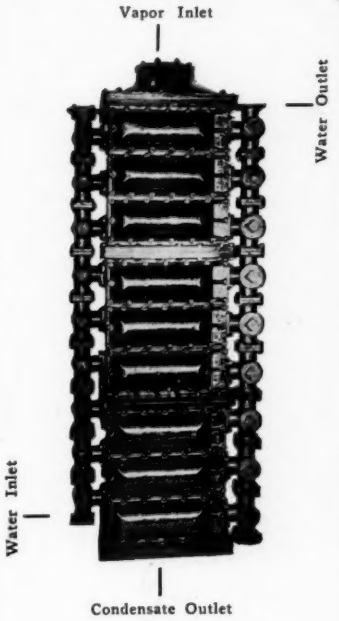

Type P-540

Capacity:
27 Bbls. Gasoline or
40 Bbls. Heavy Distillate, hourly.

Dimensions:
30"x30"x9'-2"

Vapors enter top of condenser and flow around tubes on inside of shell. The condensate cooled to within a few degrees of the cooling water flows from the bottom by gravity.

Cooling water enters condenser at the bottom, flows through the tubes counter-current to the downward flow of the vapors, in series, parallel or the combination best suited to the installation. Three way cocks control the flow of one or more independent cooling mediums.

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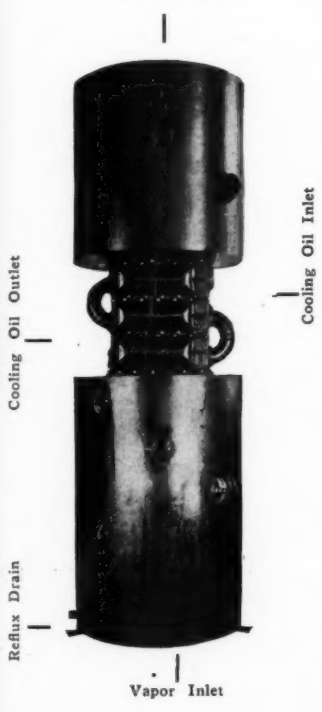

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SOUTHWESTERN construction also permits by-passing one or more units for cleaning while condenser is in operation without interfering with the operation of the rest of the condenser.

SMALL SPACE REQUIREMENTS, HIGH EFFICIENCY PER SQUARE FOOT OF SURFACE, LOW WATER REQUIREMENTS, FLEXIBILITY AND LONG LIFE OF SOUTHWESTERN EQUIPMENT HAVE COMBINED TO MAKE THIS APPARATUS IN DEMAND AMONG DISCRIMINATING PLANT ENGINEERS FOR MANY YEARS.

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April Saw Decrease in California Plant Stocks

Los Angeles, Calif.—Forty-one refineries in California operated at 72 per cent capacity during the month of April, according to monthly report compiled by the San Francisco office of the Bureau of Mines, running a daily average of 409,296 barrels of crude to stills. There was a decrease in stocks of crude and other unrefined oils at the refineries of 413,005 barrels.

There was an increase of 429,974 gallons of gasoline in storage, bringing the total storage to 246,600,953 gallons. Production of gasoline in April was 113,124,488 gallons against 112,234,823 gallons in March. There was an increase of about 3,000,000 gallons in production of kerosene, when compared with the previous month, while the increase in production of gas and fuel oils was nearly 3,000,000 gallons. Kerosene stocks reached a total of 34,452,828 gallons, showing a withdrawal of about 6,500,000 gallons during the month. Stocks of lubricants increased about 1,500,000 gallons to 17,145,071 gallons. Stocks of gas and fuel oils increased about 57,000,000 gallons to 766,688,556 gallons total.

The addition to storage of only 429,974 gallons of gasoline during April, in the face of strict regulations brought about by the hoof and mouth disease epidemic in the state, keeping thousands of cars in their garages, should dispell all gloom from the dispensers of this fluid in California, in the opinion of Victor C. Killick, statistician for the Independent Petroleum Marketers Association.

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A New Name for an Old Friend

WHAT'S in a name, anyway? The refinery construction work we are doing under the name "Pioneer" is just the same high grade as when it bore the name "Tulsa Boiler and Sheet Iron."

For eighteen years, as the "Tulsa Boiler and Sheet Iron Works" we have turned out tanks and refinery steel construction that made good friends for us among the wise buyers of the Mid-Continent. We pioneered in giving these people "close to home" service on the best kind of work.

Now, under the new name, The Pioneer Tank and Boiler Company, we're all set with the men, machinery and money to keep on growing under the Pioneer banner like we did when Tulsa Boiler and Sheet Iron was on our letterhead.

There is no change in our organization.

Get Pioneer quotations on tank and refinery construction work.

PIONEER TANK & BOILER COMPANY
(Formerly Tulsa Boiler and Sheet Iron Works)
Box 1926, TULSA, OKLA.

Several New Plants for Mid-Continent Sections

Tulsa, Okla.—Natural gasoline plant construction work in this section of the Mid-Continent field continues steadily.

The Midland Oil Company (Doherty interests) of Bartlesville, Oklahoma, are building a 21-unit natural gasoline plant on the southeast ten acres of the southwest quarter of section 12-27-5e.

The Roxana Petroleum Corporation (Dutch-Shell group) is building a 3-unit gasoline plant on the Zoller farm in section 1-14n-6e in the Stroud field in Lincoln county. It is understood the Magnolia Petroleum Company also is making plans to erect a plant in the Stroud pool.

The Sand Springs Home (Chas. Page interest of Tulsa) is building a natural gasoline plant on the Sand Springs Home property in section 6-19-12, Tulsa county, to handle approximately 20,000 gallons daily.

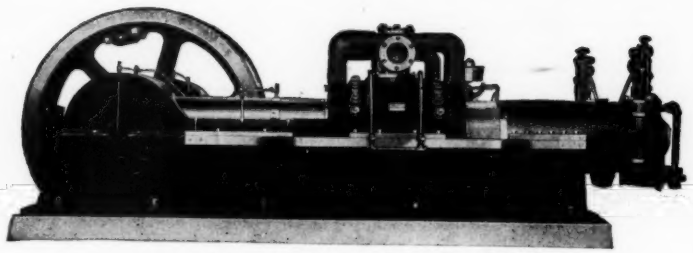
New Texas Area Offers Location of Gas Plants

Breckenridge, Texas—Development of a prolific oil and gas producing area north of Caddo in the northeast part of Stephens County in recent months will permit further expansion of the natural gasoline manufacturing industry in this section of the Central West Texas district, and the first plant for the new field is being erected by the Hope Engineering & Supply Company of Mt. Vernon, Ohio. Materials have been purchased for the plant, which is to be equipped with the absorption process, using Reeves vertical gas engines, which are manufactured by the Hope Company. When completed the plant will have a daily capacity of approximately 30,000,000 cubic feet of gas, and will represent an investment of about $600,000.

Richfield to Rebuild Old Plant With Modern Plans

Los Angeles, Calif.—Richfield Oil Company officials announce that the Richfield refinery, which was recently destroyed by fire near Bakersfield, will be rebuilt. The plant was the oldest owned by the Richfield Company. When it is rebult all the latest refinery construction methods will be used. The loss was about $250,000, fairly well covered by insurance. The fire also destroyed about 120,000 gallons of gasoline.

THE NEW ENCLOSED TYPE



Direct Gas Engine Driven Vacuum Pump, Two Cylinder

Watts-Miller Gas Engines and Direct Gas Engine Driven Compressors and Vacuum Pumps

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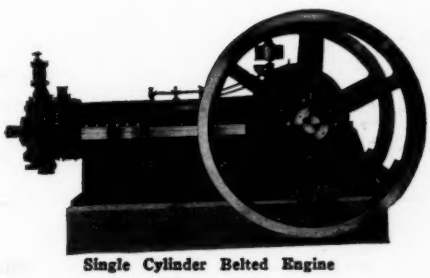
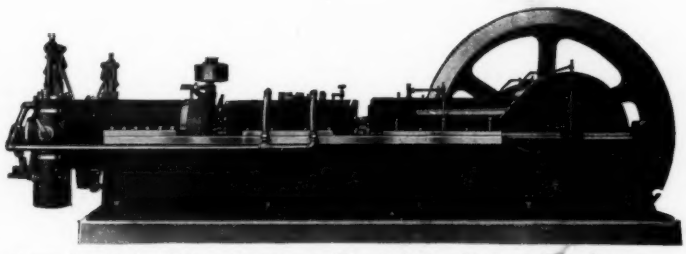
High Efficiency Gas Engines, Compressors, and Vacuum Pumps for Power Plant Equipment

Sizes from 50 to 400 h. p.



Single Cylinder Belted Engine



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Compressors particularly adapted to casing-head gasoline plants, gas pumping plants, and compressed air installations, in single and 2-stage machines to operate on practically all intake and discharge pressures.
Continuous circulating filtering automatic oiling system.

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Tell them where you saw the ad

New Absorption Plant For Salt Creek Field

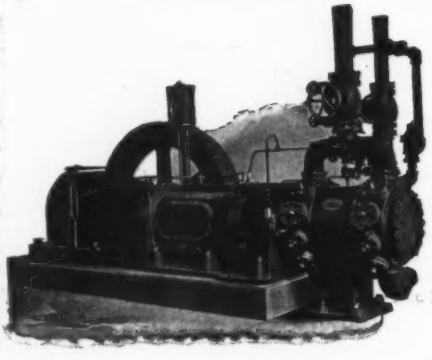
Los Angeles, Calif.—The E. T. Williams Oil Company has awarded a contract to Southwestern Engineering Company of Los Angeles for the construction, erection and equipment of a complete absorption gasoline plant in the Salt Creek field, Wyoming. The plant is to be unusually compact, complete and of latest construction for taking natural gasoline from natural gas. The plant equipment will be fabricated in the Southwestern plant at Culver City, near Los Angeles, and the erection crew is already at Salt Creek. The plant will have a daily capacity of about 6,000,000 cubic feet of gas and the contract guaranteed efficiency.

Sentinel Oil Adding to Torrance Gasoline Plant

Los Angeles, Calif.—The Southwestern Engineering Corporation has been awarded a contract by the Sentinel Oil Company for extensive additions to be made on their absorption plant in the Torrance field. The additions to the plant will consist of new equipment which will double the gas and gasoline capacities.

Four compressor units will be installed with additional Southwestern absorption, condensing, heat-exchanging and evaporating equipment. All equipment exclusive of the compressor units will be manufactured by the Southwestern Engineering Corporation at their factory in Culver City.

Vilter
Ammonia Compressors Fittings and Pipe Coils
Render Years of Reliable Service



Compressors built in several types and a great variety of sizes. Illustration is of a high speed type compressor.

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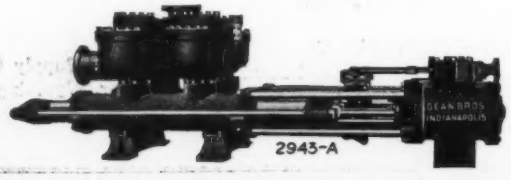
INDIANAPOLIS.
OIL PUMPS
For Hard Continuous Service

The pumps will not short stroke. Are substantially and carefully built. Have large and free passages which do not restrict the flow. Extremely economical in the use of steam.

Send for Catalogue.



Imperial Adding Four Dubbs Units to Plant

Ardmore, Okla.—Four Dubbs cracking process units are to be installed in the refinery here of the Imperial Refining Company. It is expected that the stills will be completed and in operation by September 1. Frank Mack, engineer for the Dubbs people, is now in Ardmore to superintend the installation work.

HAS NEW SALES OFFICE

C. F. Braun & Company, of Alhambra, California, have announced the opening of a district sales and engineering office in Tulsa, Okla, with A. W. Burket as district manager. The Tulsa office is prepared to make engineering survey and submit quotations on Braun products, consisting of oil refinery apparatus, casinghead gasoline plant equipment, heaters, coolers, heat exchangers, valves, grease extractors, water cooling towers, etc.

Leases Skimming Plant To Re-Run Distillates

Wichita Falls, Texas.—The Rinehart Petroleum Company has leased the Bankers Producing & Refining Company's 1,000 barrel daily capacity skimming plant located near here, and is using the plant to re-run distillates and other light oils purchased from Wichita Falls refiners. Headquarters of the Rinehart Petroleum Company are in the Morgan building, Wichita Falls.

New Absorption Plant to Be Built at Salt Creek

Casper, Wyo.—The E. T. Williams Oil Company will construct a natural gasoline plant of the absorption type in the Salt Creek field to be located in section 19-40-78 with a capacity of from 4,000,000 to 5,000,000 cubic feet daily. The plant is expected to be in operation by August 1.

CLOSES TULSA OFFICE

Jersey City, N. J.—Mid-Continent offices of the M. W. Kellogg Company of Jersey City have been discontinued and Paul Gerhard who has been in charge at Tulsa has returned here. The Mid-Continent business of the company including Cross and Fleming cracking installations will hereafter be conducted by Guy N. Harcourt at 700 Baltimore avenue, Kansas City.

Shell Company Plant in Dominguez Field Ready

Los Angeles, Calif.—The Shell Company completed its natural gas absorption plant in the Dominguez field in May and late in the month was making around 4000 gallons of gasoline daily. The natural gas comes from one of the Shell's wells and from other wells owned by the Union Oil Company. This is the second gasoline plant to be started in this new field.

Did you ever stop to figure how much gasoline you can get out of re-running your kerosene distillate, not by cracking but merely by re-running at small cost, but it will be low gravity gasoline

If on the other hand you run the distillate straight *through any cracking process*, this light portion of the kerosene will appear in the final yield as gasoline, but is misleading It was in the distillate before you ran it through the cracking plant and it comes through unchanged The only real conversion is in the remaining portion, the fraction above 450° F

In cracking charging stock without these light ends the yield of gasoline is true conversion and the gasoline will be of a lighter gravity than when cracking the blend

If you wish to crack kerosene distillate, the Dubbs Process will do it straight or blended with gas oil, fuel oil or topped crude But keep in mind the real facts and especially the reason for the lower gravity of the gasoline produced than if you first topped off the light ends before cracking

When you calculate the results, find out what the process did and what portion of the gasoline was there originally and came through unchanged

Universal Oil Products Company
Owners of the Dubbs Process
312 South Michigan Ave
Chicago Illinois

"Towers" and Tag

To those engineers now engaged in working out the development of dephlegmating towers; and to all those who are interested in achieving highest operating efficiency on existing equipment of that nature, the Tagliabue Engineering Department offers — Not only its services with regard to Automatic Temperature Control, but a line of Automatic Controllers now ready for such applications.

Without adequate automatic temperature control, without properly designed Automatic Controllers, control of end point of distillate cannot be achieved.

A word to the wise is sufficient.

We solicit inquiries from superintendents and plant engineers.

C. J. TAGLIABUE MFG. CO.
85-86 THIRTY-THIRD ST., BROOKLYN, N.Y.

Insist on Mercurial Thermometers with the TAG-Hespe-RED Reading Column

TAG

SINCE 1760

Effects of Applying Vacuum to Gas Flow

(Continued from page 34)

have more units than necessary, unless high vacuum is used properly.

If a plant is laid out with such proportion and capacity that it will care for all the gas produced at atmospheric pressure at the well at the time the wells of the field are placed on the pump, as the gas reduces in quantity, vacuum will gradually increase, and conservation will have been served to a better extent than a haphazard competitive method of applying vacuum.

Contracts for gas usually specify that vacuum on the lease in question will be maintained at least equal to that carried by offset properties. If equal vacuum is not carried, the gas contract may be abrogated, resulting in further competitive operation.

Since gas, expanding within the sand, and doing work, as set out above, produces a refrigerating effect, this may be considered briefly. And, when gas in solution is vaporized, a definite amount of heat, taken from the oil and the sand itself, and disappearing in the gas as latent heat, results in further cooling. Both these effects lower the general temperature of a sand and the writer has noted this reduction several times over a period of years.

Where the critical point of any paraffin fraction is within the range of this temperature reduction, and some fraction usually is, some of the paraffin may congeal. The maximum cooling effect, however, is fortunately at the point of maximum pressure reduction, which is at the sand face, just as the oil and gas emerge from the sand pores into the well bore. At this point, most work is done, also, causing paraffin deposition upon the sand face. See an article by the writer in Oil Weekly of August 11 and 18, 1923, on "Overcoming Paraffin Troubles in Oil Wells."

This places such accumulations of paraffin within the well bore, within reach for removal, fortunately. Vacuum, however, is not the cause of all accumulations, since wells accumulate paraffin at all stages of production, during flowing, swabbing and pumping, whether vacuum is applied or not. Just to what extent vacuum affects paraffin accumulation is indefinite, since we cannot examine its deposition either while being deposited or afterward.

If immediate and ultimate recovery of oil depends upon vacuum, as all authorities agree, then vacuum must be applied and high vacuum where necessary and all other troubles remedied as best as possible.

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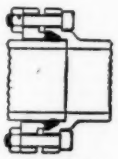

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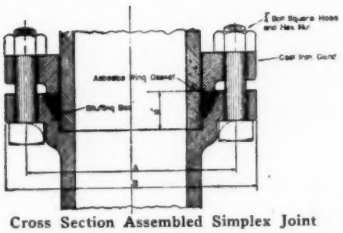

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Sal Soda wks .....cwt.	1.10–1.25
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Chloride of Lime solid .....cwt.	1.90–2.10
Sulphuric Acid 60 deg. tank cars f. o. b. shipping point.....per ton	9.00–10.00
Benzol—	
Pure Water White.....Tanks....gal.	.24 —.25
Drums....gal.	.30 ....
90% . .....Tanks....gal.	.23 ....
Drums....gal.	.28 ....

Jobbers' Supplies

Vegetable Oils—		
*Linseed, carloads Spot.....gal.		—.94
March . .....gal.		—.90
Less carload Spot .....gal.		—.97
5 bbls. or less Spot.....gal.		—.99
Boiled, tank Spot .....gal.		—.90
Boiled, carloads Spot.....gal.		—.96
Soya Bean Spot, Tanks..	lb.	—.10¼
Animal Oils—		
English Degras .....lb.		.05¼
Domestic Degras bbls. carloads ...lb.		.05¼
Horse . .....lb.		.08
Oleic Acids—		
Dist. . .....lb.		—.09
Saponified . .....lb.		—.09
Lard Oils—		
Prime		
Winter		
Strained . ..1 to 1½ ffa. 40/45c t. lb.		.13¼
Extra		
Winter		
Strained.....2 to 4½ ffa. 40/45c. t. lb.		.12
Extra .....4 to 5 ffa. 40/45c. t. lb.		.11¼
Extra No. 1....7 to 10 ffa. 40/50c. t. lb.		.11
Extra No. 1..15 to 18 ffa. 40/50c. t. lb.		.10½
No. 2.....22 to 23 ffa. 40/45c t. lb.		.10¼
Prime Edible Tallow under 1⅞ ffa. 40/45c t. N. Y.....lb.		—.08¼
Tallow acidless .....lb.		—.11¼
Lard Stearine .....lb.		—.13½
Oleo Stearine .....lb.		—.10¼
Neatsfoot Oil—		
Pure . .....bbls.-lb.		—.15
Extra . .....bbls.-lb.		—.11
No. 1 . .....bbls.-lb.		—.10½
Cold pressed .....lb.		—.18½
Fish Oils—		
Menhaden Oil		
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*Herring, tankcars coast.....gal.		—.50
Whale, extra winter bleached ....gal.		—.81
Seal		Nominal
Naval Stores—		
Turpentine, N. Y. .....gal.		.87
†Turpentine . .....gal.		.80
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Rosin F. N. Y. .....bbl.		6.00
Rosin B.† .....bbl.		4.40
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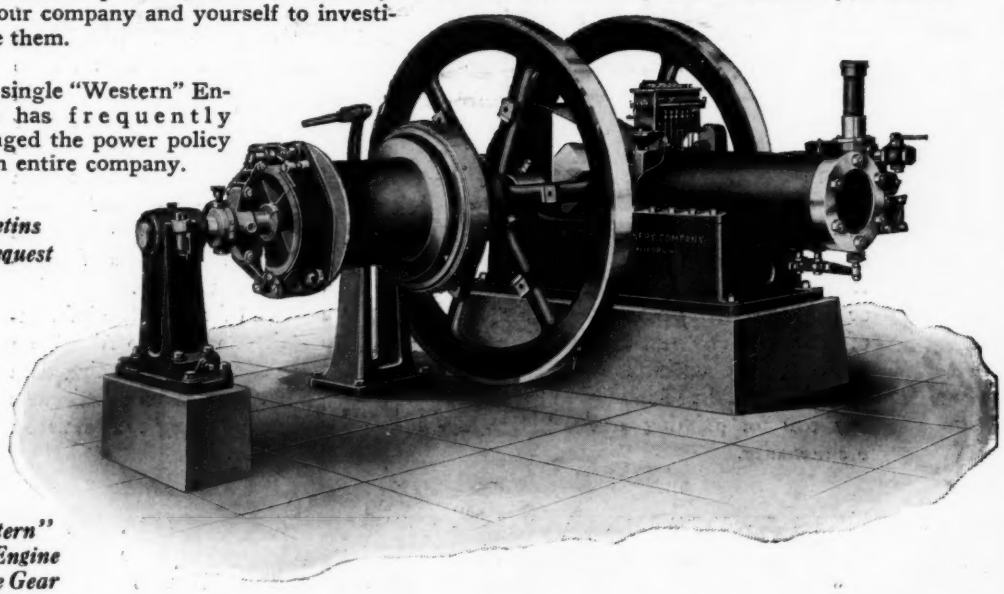

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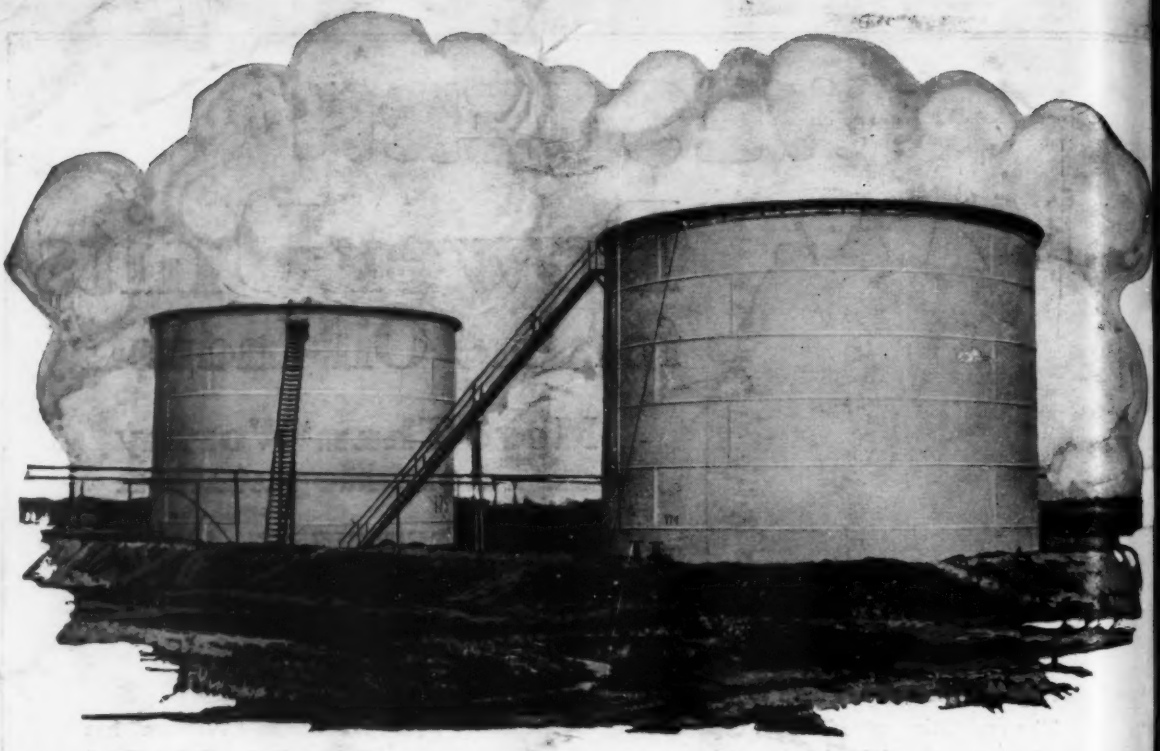

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